DECEMBER
1957
VOLUME 6
NUMBER 12

Battelle Technical Review

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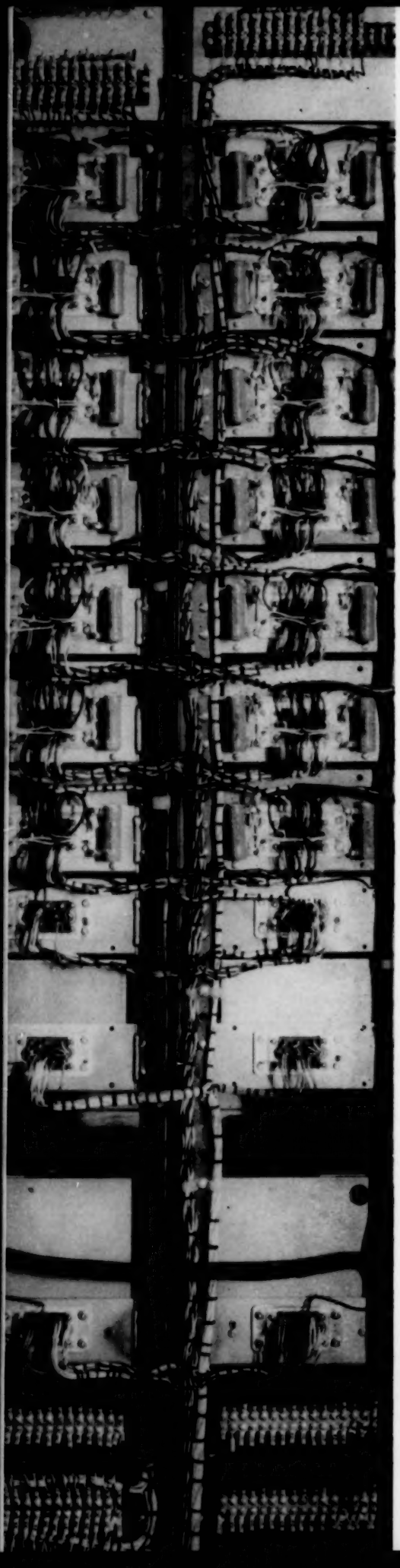
Infrared Spectroscopy—Molecular Sleuth

Volume 6, Number 12
December 1957

BATTELLE TECHNICAL REVIEW

Dedicated to the dissemination of knowledge. Published monthly by Battelle Memorial Institute, an endowed foundation serving mankind through science and technology.

Published monthly by Battelle Memorial Institute. Please address all correspondence about articles, abstracts, subscriptions and exchanges to: The Editor, Battelle Technical Review, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio. Accepted as controlled circulation publication at Columbus, Ohio. Printed in U. S. A.



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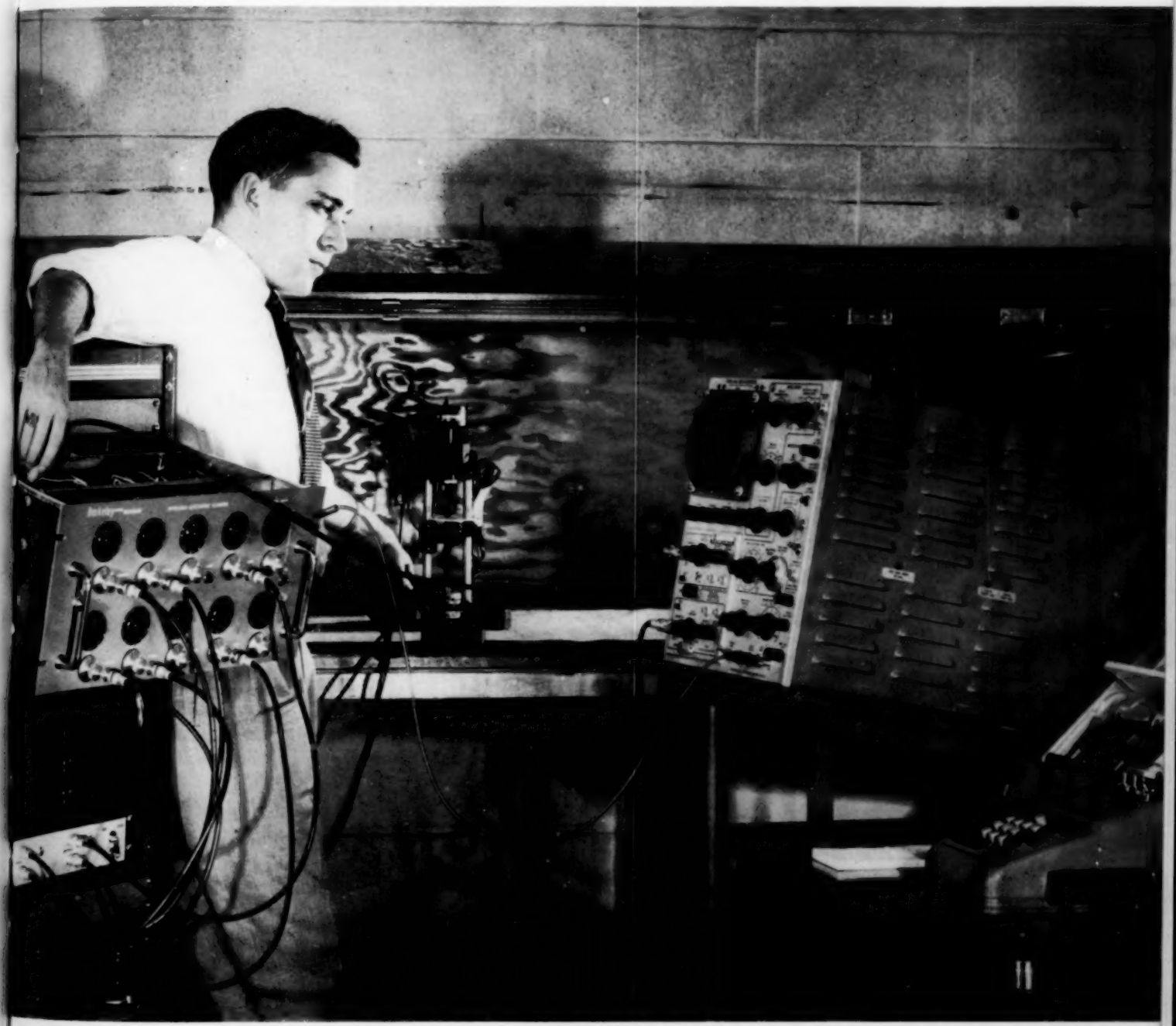
ENGINEERING and design work, of course, must precede ground-breaking in all of the nation's highway construction projects. Utilization of electronic data-handling systems is helping to speed up the solution of such engineering problems. The device shown below, being adjusted by the systems engineer, is one component of a plotter used regularly by highway engineers to get topographic data for highway planning. Conventionally, the engineer using the plotters has recorded data manually. With the new system developed at Battelle, he merely pushes a button to feed data directly into a card-punching machine, shown on the far right.



DATA HANDLER FOR HIGHWAY PLANNERS

VIGNETTE

CHEMIST

FRANK C. CROXTON

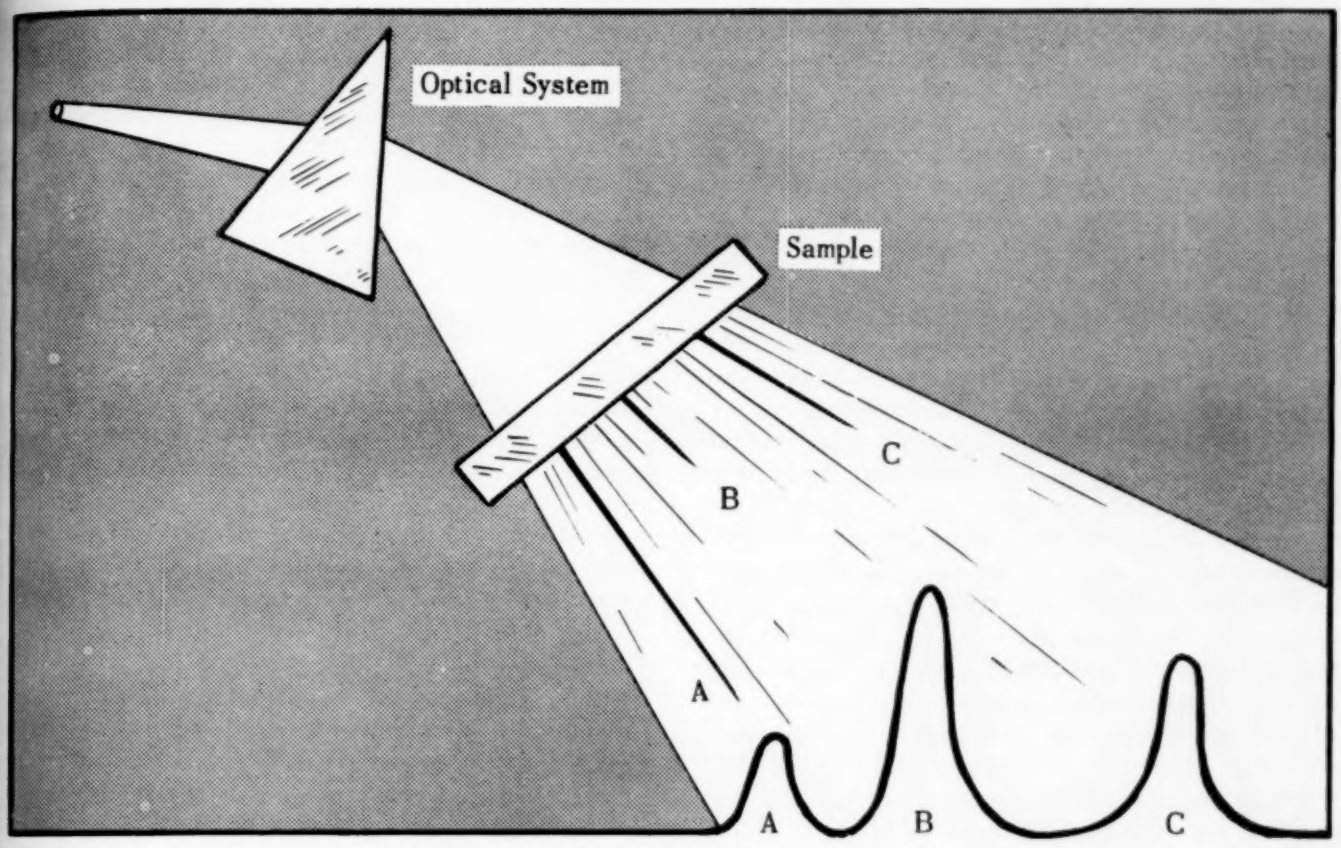
The interrelationship of the sciences has been long recognized, yet this idea has a new significance for scientists and engineers according to Frank C. Croxton, Battelle technical director. "There is scarcely a research study," he points out, "which does not require the participation of technologists from two or more disciplines. Who can say where the biologist leaves off and where the chemist or physicist begins? Realizing this, technologists welcome the cooperation of their counterparts in other fields not only for day-to-day problem solving but at higher levels—in creative thinking. By a sort of intellectual synergism, they find the results of their creative activity enhanced through group action. As a colleague of mine put it, 'My own creativity has been amplified by working with creative people.'"

Since joining the Battelle staff in 1939, Frank has been identified with the Institute's chemical research. Cooperation, so necessary to team research, developed naturally under the influence of his warm personality and ability to draw the best from each of his colleagues. He has directed studies on such problems as the utilization of petroleum-refining by-products, the chemical uses of selenium, new uses for copper, and the development of polymers. More recently, he has undertaken responsibility for diverse chemical engineering studies ranging from the investigation of plant design for and economics of poultry by-product utilization to a new process for the electrowinning of magnesium. Administratively, he has played a key role in the establishment and operation of Battelle's European laboratories. Currently he is pursuing an interest in the advancement of nonclinical medical research, particularly by an all-out attack upon medical problems through the utilization of all applicable scientific knowledge.

Frank's broad chemical interests are reflected by his active participation as a member of European and British as well as U.S. technical societies. This month, as a vice president of the American Association for the Advancement of Science, he will officiate at the meeting of Section P of the Association which is concerned with "Industrial Science". As a member of the Association's Newcomb Cleveland Award Committee, he will aid in selecting the best research paper presented before AAAS this year.

Frank's preparation for his career included study leading to a B.A. degree in chemistry and M.A. and Ph.D. degrees in physical chemistry at The Ohio State University. In the interim before his association with Battelle, he served as a research chemist with the Standard Oil Company of Indiana.

Frank and his wife, Mary, parents of two daughters, are now enjoying grandparenthood. They also find mutual enjoyment in music and traveling. Frank's personal hobbies are photography and gardening.



Schematic diagram of selective light absorption. The light is dispersed into separate wavelengths by the prism. The sample absorbs more light at the wavelengths, A, B, and C than at others, and more at B than at A or C.

Infrared Spectroscopy—Molecular Sleuth

Infrared spectroscopy has played a significant role in the recent advancements in chemistry. The author explains the factors that make it of such importance and points out areas where it may become much more useful in the future.

by CLARA D. SMITH

THERE IS A COMMON AWARENESS that in receiving heat from the sun or tuning in on the latest football scores, we are in some way picking up energy traveling through space. The many forms of this radiant energy continuously play important roles in the very existence of life and in our industrial and scientific achievements. In familiar terms, heat waves make objects warm, light waves stimulate the optic nerve endings resulting in sight, and X-rays penetrate less dense forms of matter and cast shadows of more dense hidden objects.

These forms of electromagnetic radiation—heat, visible light, and X-rays—differ from each other only in wavelength. Heat waves are longer than visible light, and X-rays are shorter than visible light. The total range of wavelengths (from gamma rays to radio waves) is known as the electromagnetic spectrum.

Just beyond the red end of the visible spectrum, and extending to the microwave region, lies the infrared portion of the spectrum. This wavelength range is 0.7 micron to a few hundred microns.

The infrared region has important applications extending from ones as old as heating to headline-new ones for guided missiles.

Heating applications of infrared are familiar to both households and industry; remarkably clear photographs taken by the penetration of infrared through hazy atmosphere are essential to modern map making; camouflage technique has been forced to a revision

of concept with the development of devices which permit "seeing" objects which differ from their surroundings, not in color but in radiation of infrared energy (warmth); sensitive systems for missile guidance use infrared radiation from the target to keep a homing missile on course. The same properties that make such applications possible have aided in bringing about many of the major chemical achievements of the past fifteen years—achievements that have come in rapid succession. One factor in this rapid advance is the use of infrared radiation which permits, in the hands of an experienced spectroscopist, quick and certain determination of molecular structure.

Infrared radiation is the chemists' probe into the motion of atomic groups in molecules which is so important in molecular diagnosis and synthesis. In the short span of two decades of rapid extension in application, it has served to unravel the structure of molecules so that duplicate and related ones can be manufactured for life-saving purposes; it has enabled production of better fuels, rubber, fibers, plastics, and coatings; it has contributed to fundamental knowledge of energies involved in molecular bonds. In short, wherever an improved understanding of molecular structure helps mankind's progress, infrared spectroscopy is a tremendously valuable aid.

Technical Background

As mentioned above, the wavelength of 0.7 micron is the boundary between visible and infrared radiation. To relate this radiation to molecules, it is perhaps more meaningful to express this particular region in terms of frequency. The commonly used frequency units are waves per centimeter (cm^{-1}). Thus the range of 0.7 micron to 200 microns corresponds to 14,000 cm^{-1} to 50 cm^{-1}.

Electromagnetic radiation is absorbed by molecules whenever the energy in the radiation corresponds exactly to the energy (in quanta) of some motion of groups in the molecule. If this motion is a stretching vibration between different atoms or groups of atoms, or a twisting or rocking or bending mode along an axis about which there is a dipole moment involved in the motion, the electric moment involved corresponds to energy in the infrared region of the electromagnetic spectrum.

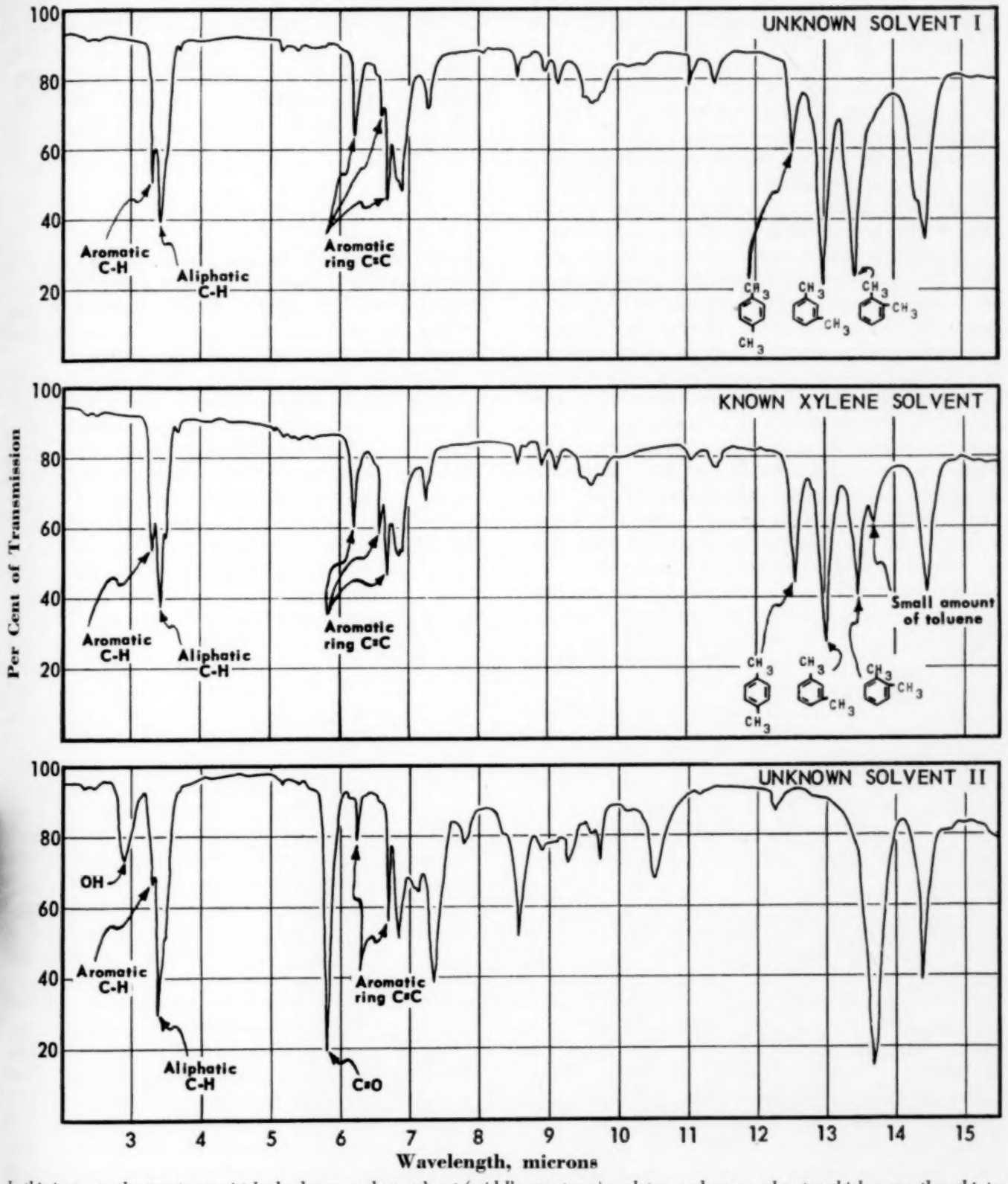
The masses and bond strengths of the particular groups in motion determine the exact amount of energy involved, and therefore determine the specific frequency of infrared radiation absorbed. This correspondence of energy to frequency is expressed by Planck's law, $E=h\nu$, which states simply that the energy in radiation is equal to a constant (h) times the frequency (ν) of the radiation.

The way in which the masses and bond strengths of the atomic groups within the molecule are related to frequency is most readily seen by analogy to molecular models wherein the bonds are considered as springs of certain strengths joining the atoms. This system may be considered, to a first approximation, to follow Hooke's law and, to this extent to be expressed by equations which hold for simple harmonic vibrations. Such an expression is *frequency* $= \frac{1}{2\pi c}\sqrt{k/\mu}$ where frequency is in cm^{-1}, c is the velocity of light, μ is the reduced mass of vibrating atoms $\left(\frac{1}{\mu} = \frac{1}{m_1} + \frac{1}{m_2}\right)$, and k is the force constant which exists between the atoms. Of course, this equation relates only to one pair of masses joined by a particular strength bond.

It can readily be seen that a molecule of several atoms will have many ways in which pairs of atoms may vibrate or bend or rock or twist relative to each other and relative to other pairs or larger groups of atoms. Actually, for a nonlinear molecule, where n is the number of atoms, there are 3n-6 modes of vibration. This does not include combination and difference frequencies and harmonics which are also observed. Accordingly, a molecule exhibits absorption at many different frequencies. For a given molecule, if the amount of infrared absorption at each frequency is plotted against a continuous frequency (or wavelength) scale, this pattern of absorption yields a characteristic spectrogram or "fingerprint" of the molecule. The unique character of this spectrogram is evident when it is realized that only if all the atoms and atomic groups in two molecules are bonded in the

The author has participated in numerous infrared spectroscopy studies. These have included preparation and interpretation of spectra of such materials as essential oils, organic coatings, lignite products, wood and chemicals from wood, semiconductors, metallo-organics, hydrocarbons, polyethylenes, glasses, and adhesives. She is coauthor of the article, "Effects of Driers on Linseed Oil and Varnish Films", which received the Carbide and Carbon Chemicals Award at the 1956 meeting of the American Chemical Society. Though Mrs. Smith is the mother of three, she finds time to serve as Chairman of the Committee on Infrared Spectral Data of the Coblentz Society and as a member of the Advisory Board of the Documentation of Molecular Spectra of the International Union of Pure and Applied Chemistry. She is also active on Committee E-13 on absorption spectra of the American Society for Testing Materials.

HOW INFRARED SPECTRA ARE INTERPRETED



In this instance the spectroscopist had a known xylene solvent (middle spectrum) and two unknown solvents which were thought to be similar to it. As described below, it will be seen that the interpretation involved both quantitative and qualitative factors. It was quickly apparent that unknown solvent I is qualitatively similar to the known solvent. The fact that the 12.55-micron peak is weaker in the unknown solvent shows that it has less para xylene than the known. That the 13.45-micron peak is stronger in the unknown shows that it has more ortho xylene than the known solvent. Unknown solvent II, however, is distinctively different from the xylene solvent. It contains O-H, absorbing at 2.9 microns, and C = O at 5.8 microns. These bands arise from isopropyl alcohol and methyl ethyl ketone respectively. Toluene is the third major component and causes the aromatic C-H band at 3.3 microns, the aromatic ring bands at 6.2 and 6.7 microns, and the strong 13.7 and 14.4 micron bands.

same way will all of the vibrational frequencies be precisely the same. Then, of course, the compound is also the same. Only stereoisomers defy distinction by infrared spectroscopy.

Spectral Interpretation

The gathering of information from a spectrum proceeds in any of several ways. The approach used depends on the nature of the sample involved and the kind of information that is needed.

For identification of an unknown material, a point-by-point spectral match is made. For example, in the illustration on page 5 the unknown solvent I is shown to be like the known xylene mixture, but unknown solvent II is different from the xylenes. This comparative approach calls for a large file of standard spectra on known compounds and common mixtures or natural products. With thousands of reference spectra each with hundreds of detailed "bits" of information, information storage and retrieval is a workaday problem in an infrared laboratory. Searching systems range from brain feed-back (nothing really works better than remembering the spectra) to notebook, needle sort, and coded IBM card-machine-sort systems. No matter which sorting technique a laboratory uses—and most labs employ a combination—searching is a continuing problem. In any case, essential reference compound data are sparse when compared to the hundreds of thousands of known compounds.

Infrared spectroscopy is also useful for quantitative analysis. Concentrations of constituent compounds may be determined by finding the strength of infrared absorption by the sample at wavelengths characteristic of each constituent. The strength shown for each constituent may then be compared with strengths of bands for known concentrations of these components in standard solutions.

For identification of a structural group on a new molecule, information accumulated over more than half a century of correlating functional groups with absorption frequencies is called upon. It was recognized as long ago as the turn of the century that there are characteristic frequencies for particular structural groups. To quote from the writings of W. W. Coblentz at the time, "There is something . . . call it a particle, group of atoms, ion or nucleus . . . in common, with many of the compounds studied, which causes absorption bands that are characteristic of the great groups of organic compounds." It has since been repeatedly shown that there are atomic groupings whose motions are free enough of interference from the rest of the molecule to be recognizably consistent.

Structural groups within molecules each have a "most characteristic" frequency range associated with a given motion. The exact position within this range for a specific group in a molecule will depend upon such factors as mass and electronegativity of other substituent groups. Thus there are many spectrally enriching effects which enable a practiced spectroscopist to tell a great deal about molecular structure of compounds.

Instrumentation

Basically, the equipment required for infrared spectroscopy is a heated source unit, optics for passing the light beam through the sample and for dispersing it into separate wavelengths, and a heat-sensitive detector for measuring the changes in energy.

Simple in principle, infrared components are, nevertheless, expensive. The cartoon depicting one man in Purchasing exclaiming to another, "Good heavens, those guys out in the lab are paying $450 a pound for rock salt!" has its root in the necessity of using unusual synthetic crystals as prism materials. The news release a few years ago about scientists with "gold-lined" equipment stemmed from the occasional practice of using gold-surfaced mirrors to maintain high reflectivity in corrosive atmospheres.

Far more exciting than these eye-catchers is the steady struggle by instrument designers to translate the very feeble energy decrease by sample absorption into a reliable electrical signal. There has been a large array of obstacles in the path of development of a stable, directly-recording per cent transmission infrared spectrometer. These obstacles include such physical factors as the continuously decreasing source energy toward longer wavelengths from the near-infrared energy peak; the difficulty in developing a sufficiently sensitive and stable thermocouple or bolometer; the susceptibility of important prism materials to clouding by moisture and to dimensional changes from ambient temperatures; and absorption bands of carbon dioxide and water vapor in the air which obscure parts of the spectrum.

The changes in intensity of the source energy with wavelength are compensated for by automatic programming of slits with mechanical and electrical cams. Spectrometer cases have been temperature-controlled to minimize wavelength errors. Spectrometers are evacuated or flushed with dry nitrogen to eliminate or diminish atmospheric absorption bands. Double-beam spectrometers have also been developed which rely on a comparison of sample-beam signal with reference-beam signal for fine compensation of source fluctuation, atmospheric absorption, and some electronic variations.

Although there are several prisms and prism-grating combinations in use throughout the total infrared spectrum, the region served by a sodium chloride prism is most widely used. This region is from 2 to 15 microns and corresponds to fundamental frequencies of relatively high bond strength and lightweight atomic groups such as those involving hydrogen, carbon, oxygen, and nitrogen as well as some combinations of these elements with heavier atoms.

Applications

Most major chemical industries can point to multiple successes of their own in applying infrared spectroscopy. These successes range from spectacular examples like the elucidation of the structure of penicillin to daily bread-and-butter quality control analyses.

In the petroleum field, infrared proved its worth many times in the analysis of experimental products from varied catalyst, temperature, and pressure runs during the development of modern refining processes. The properties of hydrocarbon structures important to gasoline performances, such as tendency to branch, aromaticity, and olefin types can be assessed by means of infrared spectra. If infrared analysis is coupled with suitable sample fractionation, individual constituents of gasoline can be quantitatively analyzed. Research for fuels of the future is aided by more elaborate experimental infrared techniques which permit studies while combustion is actually taking place and structural studies of catalyst surfaces.

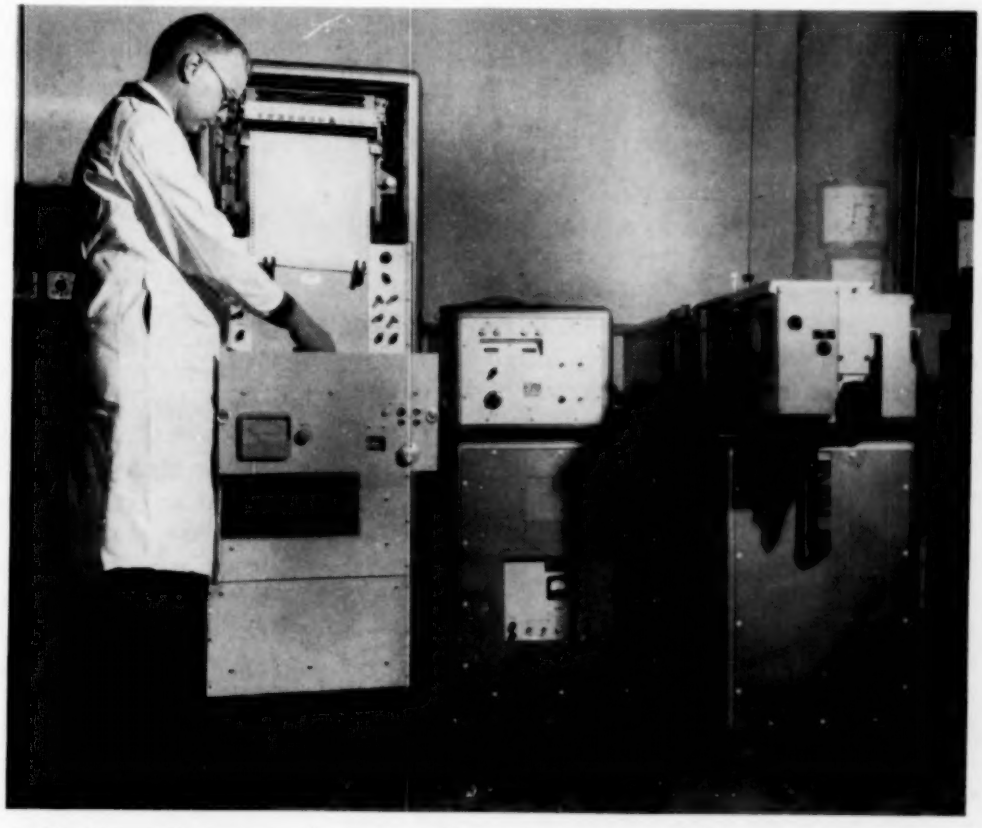
The crash World War II synthetic rubber program received many boosts from infrared analysis. Ratios of products from 1, 2- and 1, 4-addition of butadiene in polybutadiene and butadiene-styrene copolymers can be determined from intensities of the remaining olefin bonds. In most recent synthetic rubber research, the close structural matching of a new synthetic "natural" rubber to Hevea was demonstrated by matching infrared spectra.

Analysis of insecticides for active ingredients, detection of water in Freon, drug purity assays, air pollution and stream pollution analyses—solids, liquids, gases—multicomponent mixtures and critical "part per million" determinations—these are among the diversified contributions of infrared spectroscopy.

In biological fields, infrared applications to the structure of steroids is being so extensively used that an entire book devoted to the subject could not cover it. Amino acids, amides, carbohydrates, can all be studied structurally by infrared spectroscopy. Recent investigations on viruses and bacteria show useful promise—but indicate that improvement in infrared methods themselves is needed.

The nondestructive nature of infrared analysis (nothing happens to the sample except that light passes through it) as well as its reliable specificity make it valuable in crime detection and acceptable for legal purposes. The unique character of the infrared "fingerprint" makes it acceptable as proof of identity in patent claims.

Reaction mechanism and kinetic studies are facilitated by the ability of rapid-scan spectrometers to detect short-lived intermediates and record chemical changes continuously.



A direct-transmittancy recording spectrophotometer that is useful for a wide range of research applications in the field of infrared spectroscopy. The technologist is shown adjusting the tape recorder which serves as a robot for standardizing instrument conditions.

Comparison of reaction products made under irradiation conditions with products from reactions of unexcited compounds is aiding evaluation studies in radiation chemistry.

With especially designed equipment, chemical manufacturers can continuously monitor the composition of critical plant streams maintaining such important factors as (1) uniform charge to a reactor, (2) after-reaction warnings of incomplete conversion, and (3) waste gas return to proper recovery or recycle units. Continuous, automatic referencing of materials in a plant to the desired standard is a necessary ingredient in chemical automation. The selectivity and sensitivity of infrared analyzers can be expected to play a big part in this automation era.

In chemical research infrared applications are pertinent at all stages: Are the starting materials pure? Look at the infrared spectrum to tell. Did the reaction proceed? Look for the critical structural groups in the infrared spectrum, i. e., is the O-H group still there? or, is the C=O group unchanged? Is the double bond still there? It is isolated or conjugated?

If the reaction product is a mixture, needed separation procedures such as distillation, chromotography, or crystallization can be monitored by infrared. In final purification steps, tell-tale absorption bands of the starting compounds or even intermediates can be detected.

A recent development on the scene, a relatively low-cost, simple-to-operate spectrometer, may hopefully be expected to make the bench chemist as aware of the powers of the spectrometer as the spectroscopist is.

The Future

A look to the future is always hazardous, but the future of infrared seems so solidly bright that a few comments on trends are probably in order.

At the present state of development, the infrared spectroscopist must view his field with mixed reactions. There is pride and wonder at the rapid strides and increase in industrial application, the improvement in instruments, and the healthy beginning of spectrum publishing systems; frustration enters when his signal-to-noise ratio isn't high enough, or resolution good enough, or scanning time fast enough for a special application; and he is dismayed when after obtaining a fine spectrum on an important sample, he can't find a spectral match in the published literature.

The spectroscopist wants to work on ways of increasing his effectiveness in distinguishing among products belonging to large classes such as cellulosics, proteins, bacteria, and synthetic high polymers. The ways in which he can hope to do this are varied. There are obvious extensions of the present conventional spectral region. Recent instrumentation advances, centered around an infrared-sensitive photoconductor, PbS, permit rapid, high resolution spectra in the very near infrared. This region starts at 0.7 micron and usually is considered to extend to 3.2 microns. The most important information to be found here arises from overtones and combinations of hydrogen frequencies. Band intensities and symmetry in solvents of varying polarity make very detailed observation of structural variations possible. A reference library of spectra is being prepared and researchers are actively pursuing the potentialities of this near infrared region.

Beyond the 15-micron cut-off of sodium chloride, prisms made of potassium bromide, cesium bromide, and cesium iodide are being used. Investigators of the cesium bromide region (11-35 microns) are optimistic about its potentialities. Freeman Bentley, an investigator who has just completed a comprehensive review of the field, prosphesies thus: "I think we're on the threshold of a great future for the far infrared region for both analytical applications and structure elucidation; it will be used as a complement to the 2-15 micron range. It is exceptionally sensitive to phenomena arising from crystal lattice structure. Another two or three years will apparently be required before its potentialities can even be properly assessed, let alone fulfilled." Compounds with atoms of high masses and/or low bond strengths can be expected to show rich spectra in this region. Unanswered questions on structure of newly important compound-types such as metallo-organics may yield as the low-frequency spectra are studied.

Information available from the double-bond stretching region is yet to be completely explored and the use of CaF_2 optics and gratings can be expected to be pursued for many years before this store of information is fully tapped.

A fairly recent approach to increasing the sensitivity of graphical presentation of minute spectral differences has been to plot the data as first and second derivatives of the observed absorptions. The value of this procedure in enhancing inflections on the side of peaks and otherwise discriminating between overlapping bands is so obvious that the fact that it has hardly been exploited must attest to the busy state of the field—so much to be done! But it can be expected that the combinations of improved instrumentation and derivative methods may increase application of infrared to related members of classes of materials such as woody structures, viruses, and bacteria.

The combination of many applications for infrared already known and of promising extensions of its versatility, much awaiting research time, leaves no doubt about the useful future for infrared spectroscopy.

Presented on invitation last month before the Subcommittee on Economic Stabilization of the Joint Economic Committee of the Congress of the United States, this statement is most timely. In it the author enunciates thoughts pertinent to the formation of a science policy for the Nation.

Research and Technological Progress

by B. D. Thomas

A statement of the trends and outlook for technological progress is particularly timely at the present because of what we have experienced over the past several weeks in connection with the series of events that are identified in the public mind by the Russian word "Sputnik", which has entered the American language as "sputnik". Sometimes dramatic events of this kind are needed to focus attention on a matter that should be of more concern to the public than it is. One of the great lessons to be learned by us from the Russian satellite is that there is a need for a better understanding by the public of the relations between our industrial society and science and technology. Some of the almost hysterical reactions at the time were symptomatic of a lack of such understanding.

A survey in one of our midwestern states, conducted a few weeks ago, showed that ten per cent of first and second year college students did not know that Russia had launched a satellite. This survey indicates that even this presumably well-educated group does not have an up-to-date knowledge of current events nor a very profound understanding of the place of science in our economic world today. Yet it is almost self-evident that the success of a democracy depends on the consciousness that the people who compose that democracy have of the elements that sustain it. We are not like an authoritarian state which may be maintained by force. We must not only believe in our institutions; we must understand them and still believe in them, which is another matter.

I am sure that it has been made clear that the applications of science are essential to a continuing economy of abundance. The situation was summarized very clearly by Mr. Wright Patman, Chairman of Congress' Joint Economic Committee, when he said during his preliminary statement at the 1955 hearings: "Increasing productivity has provided a self-generating force for economic good in the past. In the interests of economic stability and growth, we must be alert to long-run trends and make sure that it continues that way, with its good features maximized and the resulting personal and short-run hardships, if any, kept at a minimum." There is a branch of mathematics that deals with maxima and minima and a mathematician could hardly have stated the problem better.

The subcommittee at the 1955 hearings was concerned specifically with the impact of automation on industry and the possible attendant unemployment caused by replacing men with machines. Every one of the witnesses agreed, however, that technological progress was in itself a good thing. And if I analyze the opinions correctly, there was unanimous agreement that the increased economic income gained by automation was fully capable of carrying the relatively minor costs of readjustment.

Mr. Reuther, speaking for the labor movement, which he so ably represents, stated it well when he said: "For centuries they have struggled with the economics of scarcity; now we are entering that period of human history when the tools of abundance made possible by developing science and technology make it possible for mankind to meet basic economic and material needs."

Speaking as a scientist, let me say that it is very reassuring to find such evidences of appreciation for science and technology in the Congress of the United States and among the many witnesses who have appeared before this committee. It is very easy for research men to despair of obtaining public understanding of science. Science seems to suffer from extremes of affection or dislike in the public mind and corresponding variations in public support. The period of the last several months during which there was a feeling that research was currently out of favor was very happily terminated by the assurances of support which President Eisenhower gave in his speech on "Science and Security".

Science and technology seem to be dominated in the public mind today by considerations of satellites and rockets and missiles, but I can assure you that fortunately for us there is also some other research work going on of more immediate value to human beings. The research laboratories of this country are going to continue to pour out the ideas that make living easier for more people. The devices that spare human effort, the drugs that save human lives, the agricultural developments that insure our bountiful food supply, the miracles of transportation and communication, and, of course, the thought-saving contrivances of automation will continue to increase our standard of living for the foreseeable future. Perhaps this is a good place for me to state that if the Russians would direct their research effort a little more toward raising their standard of living as we have and less toward the creation of a threat to the peace of the world, they, and we and the world, would be better off.

"According to my scientific friends, one of our greatest and most glaring deficiencies is the failure of us in this country to give high priority enough to scientific education and to the place of science in our national life."

Dwight D. Eisenhower

Each country must make a choice as to what it does with its scientific facilities. We have no way of estimating what the satellite development may have cost the Russians, either in rubles or manpower or in the proportion of their total scientific effort, which was diverted from the peaceful objectives they profess to believe in. But we do know that they still live in a climate of economic scarcity and that one cannot eat or wear or live in a satellite.

Technological Potential—Industry × Technology

The things that are said to this committee, unfortunately, are not likely to affect the doings of the Russians. But there is a lesson in this for us, too. The supply of scientific facilities in the form of trained men and laboratories is not unlimited in any country in the world. The question of what we do with our scientific effort is one that we must answer. We must decide what course we shall follow; and the decisions we make may well be of surpassing importance in determining the future of this country. Against the regimented and calculated scientific effort of a dictatorship, we must marshal the ideas of men who enjoy a greater freedom in their scientific research. Freedom is a perilous thing to hold to in the face of such a threat, but there is no other course open to us.

The decisions about our scientific effort must be made on the basis of an understanding of the real place of science and technology in our industrial complex. I would like to introduce a concept that I call the technological potential. We hear a great deal about technology and industry, research and development, basic science and applied science. All these things are of importance in the production of wealth. All must be supported, but it is well that we understand their interrelationships. Science does not in itself produce wealth; nor is it directly related to industry. An intermediary is required—and the intermediary is technology. The Einstein equation $E = mc^2$ sums up the science of the relationship between mass and energy. This is science. But between this equation and the generation of useful electric power by a nuclear reaction stands an enormous amount of extremely complicated engineering. This is technology. This is the way that the knowledge of science is transformed into physical reality.

Our modern industry is a product of two factors: knowledge of what to do and the will to do it. The first factor is supplied in our industrial complex by the technologist, and the second by industrial enterprise—the one by the engineer and technologist and the other by the business man.

The diagram on page 11 illustrates this. It is not as complicated as it appears. It shows how the knowledge of what to do derives from that part of human thought which we may designate as science, and how it combines with the part of human action which operates on the physical world to produce wealth. This interaction is what I have termed the technological potential. It exists even in the classical example of the man with a hoe. His knowledge of what he can do with a hoe is technological, and it derives from a knowledge—even though it may be primitive— of the science of agriculture.

In our modern world this interaction has become much more highly developed, and in an industrial society the technological potential results in industry. Each of the separate parts of the potential is tremendously complex. Science is so complex and specialized that it is impossible even to keep informed except in a narrow field. Scientific literature appears at a rate greater than a thousand pages per day. This is greater even than the Congressional Record! No man can read even a small part of it. I am sure that I need not point out that human action is also complex. Industrial enterprise, for example, includes all the involved economic, social, and human relations that are well known to you. One of the most important segments of industrial enterprise, for instance, is labor. Of all the forms of human action we are talking about here, labor is certainly the most immediate and direct.

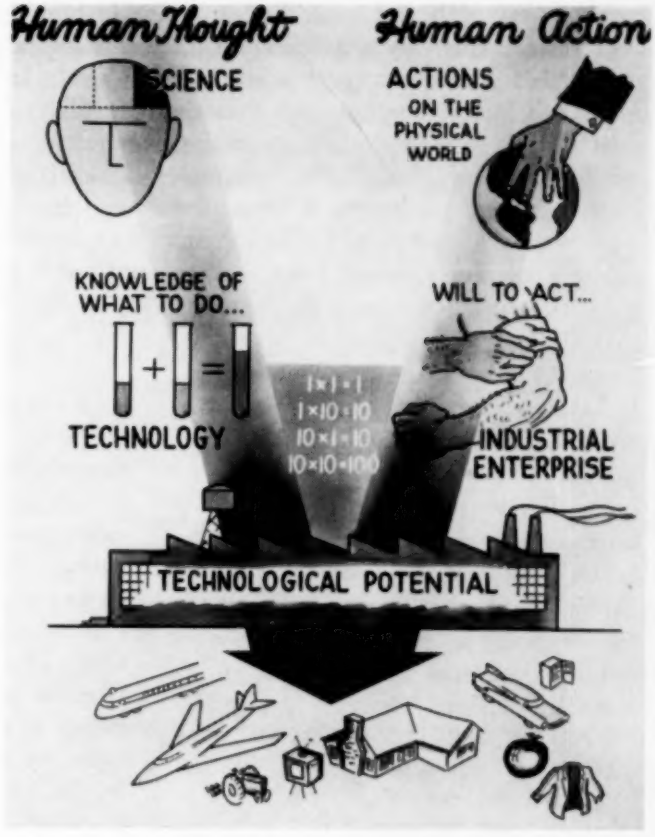
The success of an industrial economy depends on how the two factors of technology and industrial enterprise are brought together. When I said previously that industry was a product of these two factors, I meant that in a certain sense their interaction is like multiplication. When both are large, then there will be a large output from industry, and the standard of living of a country will be high. If either of the factors is low, it will inevitably reduce the national income, and if both are low, a country will have a mere subsistence economy.

Some examples will make this clear: Here is a list of some representative countries of the world placed in order of their per capita income:

1. United States
2. Switzerland
3. Great Britain
4. Sweden
5. Netherlands
6. France
7. U.S.S.R.
8. Brazil
9. India
10. China

The author, who a year ago was named director of Battelle, has served on its staff for more than 20 years. His varied scientific interests are reflected in his papers on the chemistry of sea water, his report to the President's Materials Policy and his papers and patents on methods of separating, sorting, and concentrating mineral materials.

Dr. Thomas is a firm advocate of the application of logic and integrity to all human situations. He has contributed significantly over the year to the soundness of Battelle's research policies and practices both in this country and in Europe.



It is apparent that countries at the top of the list are those that have both high technological competence and a large industrial enterprise. Those in the middle will have at least one of the two factors lower. Those countries for which both factors are low will fall at the bottom of the list. It is interesting to note that the possession of abundant natural resources is apparently of secondary importance. Switzerland, with no resources except its natural beauty, is near the top, while India and China, with very considerable natural resources, are near the bottom. But we know that Switzerland has an extraordinary technological competence and a high measure of industrial enterprise. The countries of Western Europe are in general high, but it is significant that France, with great natural resources, is comparatively low. The level of technological competence in France is high, but technology is not brought together with business enterprise in an effective way. I would hazard a guess that French industry, particularly labor, would resist automation, for example, much more strenuously than would labor in this country.

The labor per capita income and standards of living which prevail in Eastern Europe among the Iron Curtain countries may be attributed to low industrial enterprise. In some of them, technological competence

may be very high, but individual initiative in human action is officially frowned upon and the technological potential is reduced to correspondingly low levels. In Asia both factors are low and the countries of Asia exist at mere subsistence levels as a consequence.

All of us are interested in economic stabilization. High industrial production is important if we wish to maintain our high standard of living. Since I am speaking as a research scientist, I will simply point out that industrial production can be increased by anything that stimulates that part of human thought concerned with science and technology, provided it is coupled with a corresponding stimulus to human action as expressed in industrial enterprise. This may be business enterprise or it may be a better educated and more sophisticated labor force. To me, these factors appear of overwhelming significance in the structure of our industrial society.

"Science is growing and changing. An outstanding fact about the Nation's research effort is its enormous complexity which, of course, reflects the enormous complexity of Nature. Furthermore, as we gain new knowledge of the physical universe and life, things will continue to become more complex. This is the price we pay for learning."

from BASIC RESEARCH: A NATIONAL RESOURCE published by The National Science Foundation

UTILIZATION OF SCIENCE AND TECHNOLOGY

I stated earlier that our country must make a choice in the way it wishes to support and utilize technology. It must decide the way in which technology is brought into our industrial enterprise. These decisions are basic, not only to our military security but to our economic welfare, and, in a very real sense, our military security is founded on and depends on our economic power. If we accept this idea, then I would like to point out factors that should be considered in making these decisions:

1. Our supply of technological manpower is limited. It is important that it should be used to best advantage.
2. Our research facilities are limited. It is important that they be used to advantage.

These factors are almost self-evident to discerning observers. It is also apparent that there is a need to expand technical manpower and facilities. There have been numerous reports by governmental agencies, technical societies, and educational groups on the technical manpower situation. Comparisons have been drawn between our production of technically trained men and Russia's. It can hardly be said that we have yet come to grips with the problem. We have not put into our social and economic system the incentives that will attract talented young men and women into science.

The need for expansion of research facilities may be less apparent than the need for a solution of the manpower problem. But modern research requires elaborate equipment and facilities. This need must be recognized.

Up to this point, I have been trying to present a research man's view of the way science and technology fit into our economy and to show the existence of certain problems. My understanding is that the main purpose of the investigations of a congressional committee is to obtain information that may be of value to the Congress in its consideration of legislation. I hope that the recommendations that I would like to make will be useful to the committee. But I would like to take advantage of the opportunity to address an appeal to others as well. Industry, labor, the press, and educators have a need to understand these problems that confront us.

CONSIDERATIONS FOR GOVERNMENT

I am sure that most scientists in the country will be pleased with the President's decision to give greater support to basic research. This is certainly a forward step. It will help satisfy a primary need of our country which is to create and maintain an atmosphere in which science and technology will grow and continue to contribute intellectual and material benefits to our national life. This can be effected in various ways, but undoubtedly the largest single factor is the Federal Government. It is the largest spender in the field and its research policies are of fundamental importance in the scientific effort of the country. These policies should be better established and understood. There is a need for more stability in the Federal research programs. The recent curtailment is a case in point. The damage to research morale was certainly greater than the value of the dollars saved. Stability and continuity of effort are of as great importance as the actual magnitude of expenditures for research.

The policies of the Federal Government should encourage research in private industry. In England this is done by government subsidy which I do not recommend. But the same result may be accomplished by having our tax legislation encourage research and industrial progress. The country would gain if our

tax laws contained provisions which made it advantageous to industry—particularly small industry—to do scientific research.

I mentioned our failure to build into our social and economic system the incentives that will attract talented young men and women into science. I am not speaking about financial incentives entirely; although it may be remarked in passing that in the Soviet Union, scientists and engineers enjoy the highest paid positions. The highest salary in the entire country is paid to the President of the Soviet Academy of Science. But here I think our failure to attract young people into science and engineering stems more from a public attitude than from considerations of income. And this attitude is engendered more by some of our basic educational policies than any other factor. The salaries paid our public school teachers are a national disgrace and evidence of public indifference toward learning. The tendency to designate scientists as "long hairs", "egg heads", and other derogatory expressions that I am sure will occur to you, is further evidence that public sympathy for and understanding of science do not run very deep. We can ill afford such extravagant byplay in a competition with a hostile power that places science on a pedestal. The press, radio, and television have some responsibility in this matter.

To me, one of the most reassuring aspects of the inquiry conducted by Congress' Joint Economic Committee has been to note that several of the labor leaders that have appeared before it have been accompanied by research assistants. This is evidence that the responsible leadership in our labor movement is alive to the realities of our modern life. Even though the research activity of a labor union may be concerned with economics and social science rather than the physical sciences, it nevertheless indicates an awareness of the problem that is reassuring. Such an effort cannot fail to disclose the importance of science and technology to the rank and file and to educate them in its more significant phases. I am speaking as a research man when I say that an educated, enlightened, and sophisticated labor movement is essential to sound industrial enterprise.

To summarize, I would like to repeat and emphasize that:

1. The science and research facilities of this country are not unlimited, and they should be utilized in ways that will do the most good. The policies of the Federal Government in this utilization will be of paramount importance, and great wisdom will be necessary in the direction of its scientific effort.
2. Our industrial enterprise and our economic stability are still dependent on scientific research and development. This must not be lost sight of in any reorganization of our research.
3. There is a pressing need for more public appreciation of the role of science and technology in our economy. This appreciation must be built up through education and sympathetic support from all parts of our society—labor, the press, radio, and television.

I would like to make one further observation. The place of science in the daily life of every one of us has changed completely in the past twenty years. And I am not speaking of just scientists. There is no one in this country whose life has not been made quite different from the one his father lived by the revolutionary changes effected by science. Perhaps it will take a new generation to recognize the full significance of this fact, and several generations to make the economic, social, and moral readjustments which are required as a consequence. But the sooner we set about it, the better.

". . . the suggestion that basic research must have no practical motive or immediate application creates a dilemma . . . The full story would require display of the interpendence between basic and applied research and would not minimize the fact that traffic in inspiration, ideas and techniques moves in both directions. Whether a given research project deserves to be classified as basic or applied must ultimately be a matter of personal opinion."

Chester I. Barnard, "A National Science Policy", *Scientific American*, November, 1957

NOTES from BATTELLE

* ELECTRON MICROANALYZER

An electron probe microanalyzer, designed and built at Battelle, has just been completed and placed in service at the Institute. The Battelle analyzer, though not new in principle, is a relatively advanced working model with unique features in its design, according to Dr. C. M. Schwartz, chief of Battelle's structural chemistry division.

The microanalyzer is expected to be a particularly valuable tool for Battelle scientists requiring extremely precise analyses of metals, ceramics, and chemicals. With it, they will be able to isolate for analysis a region less than 1/10,000 of an inch in diameter (2½ microns) on any specimen being studied. The equipment can be used in the analysis of all of the elements from aluminum (Element 13) through the remainder of the Periodic Table of Elements. The new apparatus is capable of performing chemical analysis on a much finer scale than is possible using conventional microanalytical procedures, the builders point out. Battelle staff members who had a leading part in building this analyzer, similar to several now under development in the United States, were Dr. Alfred E. Austin, Neil A. Richard, and Arthur P. Young.

The equipment works on principles recognized and applications foreseen by scientists since the early 20th century. The first microanalyzer was built in 1949 by Dr. Raymond Castaing, a French scientist working under Professor A. Guinier, who proposed the method of analysis employed in this equipment.

The Battelle analyzer uses a heated tungsten filament to provide electrons which, after being accelerated through a 50,000-volt potential gradient, bombard specimens being analyzed. The focused electron beam excites X-radiation of the material being studied, and the X-radiation then passes through a curved crystal vacuum spectrometer. The crystal's position is varied to segregate each element being sought in a specimen.

A Geiger counter, also mounted in the vacuum chamber, detects the wave length passing through the crystal and accurately counts the X-radiation for quantitative and qualitative analysis. An automatic recording device graphically portrays this information as a permanent record of the analysis. A microscope mounted in the microanalyzer permits visual study of the specimen, while it is in the vacuum chamber for analysis. Also included is a specimen translation device incorporated to permit the operator to precisely scan the specimen and "pinpoint" areas of highest and lowest concentration of the element under study.

* RADIATION-EFFECTS DATA

An information center has been established by the Air Force at Battelle to gather and disseminate data concerning the effects of nuclear radiation on materials and systems which may be required in aircraft of the future. It will be known as the Radiation Effects Information Center.

The Center is being set up to assist those people concerned with the Air Force's nuclear propulsion program, according to Major John R. Burke of the Directorate of Nuclear Systems, Air Research and Development Command, and project engineer for the R.E.I.C. Nuclear-propelled aircraft will need radiation-resistant materials, components, and equipment, he pointed out. Hence, the Air Force believes it essential that the latest information on radiation effects be made available in useful form to aircraft designers, equipment engineers, and others concerned with radiation-effects research.

To fill this need, the Radiation Effects Information Center at Battelle will compile, evaluate, and summarize all pertinent data and make it available to those designated by the Air Force. The Center will disseminate information through reports, memorandums, and monthly listings of data reviewed; through personal exchange of information between the Center's staff and the Air Force and its contractors; and through symposia and group meetings. In addition, the Center will assist the Air Force in defining those areas in which radiation-effects research should be initiated or expanded, in coordinating information for those engaged in research and development in this field, and providing current information on facilities where radiation effects testing may be conducted.

While the Information Center has been established to support the Air Force's nuclear-propelled aircraft program, its services are being extended to the Army, Navy, Atomic Energy Commission, and other government agencies, as directed by the Air Force.

(continued opposite inside back cover)

Writings by STAFF Members

Equipment for Corrosion and Heat-Treatment Studies of Radioactive Materials. G. D. Calkins, J. E. Whitney, and E. C. Lusk. *ASTM Bulletin*, no. 224, September, 1957, pp. TP145-TP147.

An apparatus for conducting postirradiation heat treatments outside of the hot cells was constructed and tested. A postirradiation corrosion experiment is described, also a typical heat-treatment experiment, including measurement of fission gas evolved during treatment. A procedure for testing several specimens simultaneously in the autoclave is included.

Contribution to the Knowledge of Copper as a Plant Nutrient. Frank A. Gilbert. *Agrochimica*, v. 1, March 1957, pp. 136-151 + 3 plates.

Research on the effect of added Cu in the soil indicated that yield responses may be obtained even in soils with no apparent Cu deficiency. Both soluble and insoluble forms may be used. Copper leaches very slowly, even in soils with no apparent Cu deficiency. Both soluble and insoluble forms may be used. Copper leaches very slowly, even in sandy soils, and residual effects in mineral soils last for several years. There is little danger of toxicity from fertilizer containing as much as one per cent of Cu.

Food From Fungi. Frank A. Gilbert and Radcliffe F. Robinson. *Economic Botany*, v. 11, April-June, 1957, pp. 126-145.

If and when economic conditions and technological advances become favorable, fungi may some day be significant in furnishing human food through their protein-synthesizing capacity. The yeast, *Torulopsis*, has already been utilized on a commercial scale in several countries. Molds and other microorganisms can be of great value in utilizing the food energy of materials now discarded as waste because they are not in a form suitable for human consumption.

The Vibration Spectrum and Structure of Tetramethyldithio-Diphosphine. J. Goubeau, H. Reinhardt, and D. Bianchi. *Zeitschrift für Physikalische Chemie, (Frankfurt)*, v. 12, no. 5-6, September 1957, pp. 387-392.

Infrared and Raman spectra were examined and symmetry relationships were established for the transform. The results confirm data from chemical investigations. The chemical stability against oxidation and hydrolysis indicates the presence of four bonds on each of the phosphorus atoms.

These Aluminum Enamels Resist Corrosion by Boiling Alkaline Water. B. W. King, W. H. Duckworth, John Schultz, and H. P. Tripp. *Ceramic Industry*, v. 69, October 1957, pp. 82-84.

Enamels for 25 Al were developed which exhibited corrosion rates of about 1/75 that of bare Al when exposed to boiling water for 100 hours. These enamels were based on the Na_2O-PbO-SiO_2 eutectic composition with substitutions of a total of 10 to 15 weight per cent of TiO_2, ZrO_2, and alkaline earth oxides for PbO and Na_2O. About one weight per cent NiO was beneficial for promoting adherence.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

A Wire-Activation Technique for Reactor-Flux-Profile Measurements. Alton E. Klickman and Francis R. DeFalco. *Communication and Electronics*, 1957, no. 32, September, pp. 428-430.

The application of the wire-activation technique was extended so that flux profiles could be obtained in the cores of pressurized water-type reactors. Tests with Mg with 0.01 at. per cent indium, 0.010 inch in diameter, showed that the method is feasible and the counting rates are high enough to give reliable results.

Apparatus for Continuous Measurement of the Nitrifying Capacity of Nitrifying Acids. **Gerat zur kontinuierlichen Messung des Nitriervermogens von Nitriersauren.** H. Krupp and W. Letschert. *Chemie-Ingenieur-Technik*, v. 29, August 1957, pp. 517-519.

A new apparatus is described which measures the thermal gradients occurring in the reaction between nitrifying acid and benzol, and thus continuously determines the nitrifying capacity of the acids.

Ammonium Carbonate Pressure Leaching of Uranium Ores. B. G. Langston, R. D. Macdonald, and F. M. Stephens, Jr. *Mining Engineering*, v. 9, September 1957, pp. 989-993.

Experiments demonstrate that the $(NH_4)_2CO_3$ pressure leach is a technically attractive method for extracting U from high lime ores. Advantages include low reagent cost for precipitation and the recovery of substantially all of the ammonia.

Casting Large Ingots of Uranium. G. W. P. Rengstorff and H. W. Lownie, Jr. *Metal Progress*, v. 72, September, 1957, pp. 76-78.

Sound ingots, 7-inch diameter, weighing 1200 lbs. and with 91 to 95 per cent recovery in metal, can be cast in iron molds after induction melting the uranium "derbies" in magnesia or graphite crucibles under open argon atmosphere. A small amount of $BaCl_2$, added shortly before pouring, protects the stream of molten metal from oxidation.

Performance of Composite Peltier Junctions of Bi_2Te_3. Theodore S. Shilliday. *Journal of Applied Physics*, v. 28, September 1957, pp. 1035-1042.

An experimental Peltier refrigerator utilizing thermo-elements of annular configuration was designed, constructed, and operated. The device was operated under "no-load" conditions over a range of power inputs and exhibited a maximum ΔT of 49 C. Experimental performance confirmed theoretical predictons within experimental error.

Metallic Materials. Charles R. Simcoe. *Mechanical Engineering*, v. 79, August 1957, pp. 720-724.

Among the metals in quantity use today, but commercially unavailable a decade ago are titanium, zirconium, and molybdenum. New processes developed include vacuum melting and vacuum casting to minimize the hydrogen content of iron and steel. Chem-milling permits the etching out of excess metal where machining would be difficult. Cladding and honeycomb construction permit combination of metals or alloys to take advantage of their combined properties.

Processing Variables, Reactivity, and Sinterability of Uranium Oxides. D. A. Vaughan, J. R. Bridge, A. G. Allison, and C. M. Schwartz. *Industrial and Engineering Chemistry*, v. 49, October 1957, pp. 1699-1700.

Methods of preparing uranium dioxide to yield sintered bodies of high density were investigated because of current interest in this material as a reactor fuel. Wet milling of uranium trioxide before reduction increases the sinter density of uranium dioxide form 70 to 95 per cent of theoretical, when formed at 20,000 psi. and sintered at 1650 C.

WORLD-WIDE ABSTRACTS

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871a Welding and Joining
873a Miscellaneous

BATTELLE Technical Review ABSTRACTS

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

17102 Some Notes on Sandwich Design for Minimum Weight as Applied to Airplane Wings. J. G. Willis. *Aeronautical Engineering Review*, v. 16, Oct. 1957, p. 44-47.

A solution to the problem of devising a form of construction to maintain contour and smoothness, yet effectively use material with weight to meet strength and stiffness requirements.

17103 The Controlled-Temperature-Pressure Range. F. D. Bennett. *Aeronautical Engineering Review*, v. 16, Oct. 1957, p. 63-68.

Survey of the research and development program which has culminated in operation of the controlled-temperature-pressure range for production of flows up to Mach 11. Methods of control of temperature and pressure in the 45-ft. working section. Instrumentation necessary for measurement of projectile drag coefficient and density throughout the field of flow.

17104 Problems of Stability and Control for VTOL Aircraft. James A. O'Malley, Jr. *Aeronautical Engineering Review*, v. 16, Oct. 1957, p. 78-84.

Considers the various flight paths which can be utilized during VTOL and the resulting aerodynamic, gyroscopic, and inertial influences on the airplane.

17105* The Oscillating Two-Dimensional Aerofoil Between Porous Walls. D. G. Drake. *Aeronautical Quarterly*, v. 8, Aug. 1957, p. 226-239.

A porous wall is assumed to have the property that the ratio of the normal velocity at the wall to the pressure drop across the wall is constant.

17106* Maximum Ranges of Intercontinental Missiles. Derek L. Lawden. *Aeronautical Quarterly*, v. 8, Aug. 1957, p. 269-278.

Tables are included from which the optimal trajectories of missiles may be computed when two design parameters are known.

17107* Notes on the Mathematical Design of Nozzles and Wind Tunnel Contractions. N. T. Bloomer. *Aeronautical Quarterly*, v. 8, Aug. 1957, p. 279-290.

Coordinates of three-dimensional nozzles of several types were obtained as explicit functions and the shapes plotted.

17108 Measurement of the Moment of Inertia of Missile-Type Bodies. A. B. Schwartz, S. Malick, and J. R. Friesen. *Aircraft Engineering*, v. 29, Sept. 1957, p. 271-274.

A bifilar torsion pendulum was constructed and used to determine the moment of inertia of a body experimentally. The system gave results which were accurate to within ± ½% of the true values.

17109 Aircraft Hydraulics. v. I. Hydraulic Systems. H. G. Conway, editor. 146 p. 1957. Chapman & Hall, London. (TL697.H9 C76a)

Hydraulic fluids. Hydraulic theory; the flow of fluids. Performance problems of pipes and components. General system problems and corresponding circuits. System installation and development of testing problems.

17110* The Automatic Handling of Experimental Data in Wind Tunnels. J. F. M. Scholes. *British Communications & Electronics*, v. 4, Oct. 1957, p. 604-611.

Basic requirements of a data-handling system. Integration of measuring instrument, analog-to-digit converters, computers, and plotters and curve drawers to form a complete system.

17111* (French.) Supersonic Flow Around a Delta Wing With Subsonic Leading Edges. **Écoulement supersonique autour d'une aile delta à bords d'attaque subsoniques.** Robert Legendre. *Comptes Rendus*, v. 245, Aug. 26, 1957, p. 889-891.

The potential of the perturbation speed was deduced by means of quadratures from solutions of Dirichlet problems.

17112* (Russian.) Hypersonic Flow Past an Airfoil With a Slightly Blunted Leading Edge. **Vliianie malogo zatupleniia perednei kromki profilia na ego obtekanie pri bol'shoi sverkhzvukovoi skorosti.** G. G. Chernyi. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 721-724.

Mathematical calculation.

17113* (German.) The Latest Developments in Aeronautical Radio Navigation. **Die jüngste Entwicklung der Funknavigation in der Luftfahrt.** Erwin Roessler. *ETZ, Electrotechnische Zeitschrift*, v. 9, Ausgabe B, Aug. 1957, p. 335-339.

Basic principles of the revolving radio beacon and of hyperbolic navigation. The Tacan method: instrumnts, ground antenna, and range finding.

17114 Guided Weapons. Eric Burgess. 255 p. 1957. Macmillan Co., New York. (UG630 B97g)

Historical development and technical details of the different types of guided missiles.

17115 Blow-Down Tunnel Results in 90 Seconds. *Instruments and Automation,* v. 30, Sept. 1957, p. 1704-1705.

On-line computers deliver reduced, meaningful data only 20 seconds after a run in this Mach 5.5 blow-down tunnel.

17116 Supersonic Track Facilities at the Naval Ordnance Test Station. B. R. Egbert and D. P. Ankeney. *Jet Propulsion,* v. 27, Sept. 1957, p. 985-991.

Problems of rocket-propelled carrige design is discussed.

17117 Measurements of Vibration Environment in a Supersonic Liquid Propellant Rocket Sled. G. M. Barr and S. C. Morrison. *Jet Propulsion,* v. 27, Sept. 1957, p. 1017-1021.

Nose section vibration was generally random in nature. There was no particular starting shock.

17118 Sled Testing the Emergency Escape System: The Human Factor. James F. Hegenwald, Jr. and Edward A. Murphy, Jr. *Jet Propulsion,* v. 27, Sept. 1957, p. 1025-1033.

Results of more than 20 ejection sled tests are summarized.

17119 On the Flow Over a Finite Wedge in the Lower Transonic Region. Hideo Yoshihara. *Journal of the Aeronautical Sciences,* v. 24, Sept. 1957, p. 661-666.

The flow over a two-dimensional finite wedge at zero angle of attack for subsonic free stream Mach numbers is computed using the Kármán-Guderley transonic approximation. The location of the terminating shock wave as well as the pressure distribution is computed.

17120 Normal-Force Characteristics of Delta Wings at Supersonic Speeds. Seymour Lampert. *Journal of the Aeronautical Sciences,* v. 24, Sept. 1957, p. 667-674.

A family of five delta wings was designed to cover the range of slope ratios, leading-edge slope to Mach wave slope, from 0.15 to 4.1. Lift or normal-force characteristics for these wings were systematically studied as a function of Reynolds and Mach numbers. The results of these investigations are presented as normal-force coefficients per radian for the Mach number range 1.33 to 4.55. For a given wing the systematic variation of the wing profile indicated that there existed a much greater dependence of the lift on profile or edge configuration than on Reynolds number for slope ratios greater than 0.70.

17121 Flutter of a Helicopter Rotor Rotating in Its Own Wake. R. Timman and A. I. van de Vooren. *Journal of the Aeronautical Sciences,* v. 24, Sept. 1957, p. 694-702.

A theory is presented which enables the calculation of the aerodynamic forces acting on a rotor which is rotating in still air. The flutter frequency is an approximate multiple of the rotor speed, which means that an accumulation of vortices in the wake takes place. Experiments with a small two-bladed rotor model confirm the new theory.

17122 New Method of Flow Visualization for Low-Density Wind Tunnels. R. A. Evans. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1005-1010.

Method employs the obsorption by oxygen of radiation in the wavelength region 1400 to 1500 A. A Xe discharge is used for the source of radiation, its 1470 A resonance line being isolated by a CaF vacuum monochromator.

17123 Liquid Rocket Engine Control. Rudolf H. Reichel. *Missiles and Rockets,* v. 2, Sept. 1957, p. 101 + 3 pages.

Problems have increased in number and complexity leading to a more complicated engine configuration.

17124* (English.) **Application of the Thin-Wing-Expansion Method to the Compressible Flow Past Profiles of Arbitrary Shape.** Humio Naruse. *Physical Society of Japan, Journal,* v. 12, no. 8, Aug. 1957, p. 959-968.

Formulas are very useful because of their convergency. Accuracy is very good up to high Mach numbers.

17125* A Study in Body Ballistics: Seat Ejection. F. Latham. *Royal Society, Proceedings,* v. 147, ser. B, Aug. 24, 1957, p. 121-139.

Natural frequencies and damping characteristics of the ejected system (man and seat) were determined by subjecting the instrumented body to continuous vibrations over the frequency range from 1 to 20 c/s, and also by investigation of its response to spike- and step-force functions in sledge-hammer and seat-drop experiments. A rate of change of acceleration of 300 g/s with a maximum peak acceleration of 25 g should be considered as limiting factors for accelerations tolerable by the body. It is suggested that the optimum duration of the thrust is approximately 0·23 s and a maximum overshoot in peak acceleration in the body would result with a rate of change of acceleration of 400 g/s applied to the seat.

17126 Calculated and Measured Stresses in Simple Panels Subject to Intense Random Acoustic Loading Including the Near Noise Field of a Turbojet Engine. Leslie W. Lassiter and Robert W. Hess. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4076, Sept. 1957, 33 p. (TL570 Un3t)

17127 Effects of Airplane Flexibility on Wing Strains in Rough Air at 5,000 Feet as Determined by Flight Tests of a Large Swept-Wing Airplane. Richard H. Rhyne and Harold N. Murrow. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4107, Sept. 1957, 32 p. (TL570 Un3t)

The amplification of strain per unit acceleration in gusts, as compared with strain per unit acceleration for a rigid and quasi-rigid reference, increases with outboard spanwise station to a maximum amplification factor of 2.72.

17128* (German.) Experimental Investigation of New Laminar Profiles for Gliders and Helicopters. **Experimentelle Untersuchungen an neuen Laminarprofilen für Segelflugzeuge und Hubschrauber.** F. X. Wortman. *Zeitschrift für Flugwissenschaften,* v. 5, Aug. 1957, p. 228-243.

Based on theoretical concepts, new laminar airfoil sections were designed and tested in a low-turbulence wind tunnel together with two NACA laminar airfoil sections at Reynolds numbers between 0.7×10^6 and 1.8×10^6.

See also: **17243** (non-metallic materials for missiles); **17603** (computer control from test data); **17613** (computer calculation); **17626** (simulation of aircraft dynamics); **17692** (electronic equipment reliability); **17767** (preflight check of weapons systems); **17800** (inviscid hypersonic flow over blunt bodies); **17857** (satellite orbits); **17897** (jet propulsion systems); **17900** (design of jet engine test cells); **17903** (flow in unstaggered cascade); **18133** (elevated-temperature behavior of metal structures).

AGRICULTURE

17129 Methods and Equipment for Low Energy Irradiation of Seeds. O. A. Brown, R. B. Stone, Jr., and Henry Andrews. *Agricultural Engineering,* v. 38, Sept. 1957, p. 666-669.

Low cost equipment requiring only a fundamental knowledge of electricity shows promise as aid to research in the application of irradiation of seeds.

17130* (French.) The Dissolution of Slightly Soluble Phosphates in the Soil, Studied by Isotopic Dilution. **Sur la dissolution de phosphates peu solubes dans le sol, etudiee par dilution isotopique.** G. Barbier, M. Lesaint, and P. Quillon. *Agrochimica,* v. 1, June 1957, p. 210-222.

Solubility of ground calcium phosphates was investigated by resins with anion retention.

17131 Isolation and Synthesis of an Insect Resistance Factor From Corn Plants. Edward E. Smissman, Jules B. LaPidus, and Stanley D. Beck. *American Chemical Society, Journal,* v. 79, Sept. 5, 1957, p. 4697-4698.

Procedure for isolation of one of three chemical factors which have been shown to be responsible for the resistance of corn plants to attack by the European corn borer. The compound was shown to be 6-methoxybenzoxazolinone. The procedure for a chemical synthesis of this resistance factor is reported.

17132 X-Ray Powder Diffraction Patterns of Some Organic Compounds. D. H. Lennox. *Analytical Chemistry,* v. 29, Oct. 1957, p. 1433-1435.

X-ray powder diffraction data are presented for three sulfa compounds, two chlorinated hydrocarbon insecticides, and the fungicide Nabam and four related compounds.

17133* Translocation of Organic Nitrogen in the Xylem. E. G. Bollard. *Australian Journal of Biological Sciences*, v. 10, Aug. 1957, p. 292-301.

Determinations were made of the nitrogenous compounds present in xylem sap from a range of dicotyledons, monocotyledons, and gymnosperms.

17134* The Influence of Progressive Increases in Total Soil Moisture Stress on Transpiration, Growth, and Internal Water Relationships of Plants. R. O. Slatyer. *Australian Journal of Biological Sciences*, v. 10, Aug. 1957, p. 320-336.

17135 Translocation of Radioactive Sugars in the Stems of Soybean Seedlings. C. D. Nelson and Paul R. Gorham. *Canadian Journal of Botany*, v. 35, Sept. 1957, p. 703-713.

Translocation was mainly downward for glucose-C^{14}, sucrose-C^{14}, and fructose-C^{14} for 3 to 15 minutes after inoculation.

17136 Cytotaxonomy of Carex Section Capillares. Askell Löve, Doris Löve, and Marcel Raymond. *Canadian Journal of Botany*, v. 35, Sept. 1957, p. 715-761.

Capillares of the genus *Carex* was studied from the cytological and taxonomical points of view.

17137* The Growth and Mineral Content of Flue-Cured Tobacco as Influenced by Reaction of Nutrient Solutions With Ionic Forms of Nitrogen. E. T. McEvoy. *Canadian Journal of Soil Science*, v. 37, Aug. 1957, p. 79-83.

17138* Soil Conditioners—Their Effect on Coarse-Textured Soils, Crop Yields and Composition. R. M. Holmes and S. J. Toth. *Canadian Journal of Soil Science*, v. 37, Aug. 1957, p. 102-112.

Conditioner chemical that were slightly hydrophobic were most effective.

17139 Comparative Biochemical Aspects of Insecticidal Action. F. P. W. Winteringham. *Chemistry & Industry*, 1957, no. 36, Sept. 7, p. 1195-1202.

Mammalian and insect metabolism are compared.

17140* (German.) Drying of Crops by Electrically Heated Air. **Getreidetrocknung mit elektrisch angewärmter Luft.** P. Borstelmann. *Elektrowärme*, v. 15, July 1957, p. 269-271.

Indicates the requirements which drying installation must satisfy and how they are to be met, and shows that the installation of an electrical air-heating plant eliminates the risks associated with adverse weather conditions.

17141 Note on Possible Effect of Electric Field on the Growth of Pants. Harlan T. Stetson. *Franklin Institute, Journal*, v. 264, Sept. 1957, p. 169-180.

Describes experiments and results in this incomplete study.

17142* Cytogenetic Effects of X-Rays and Thermal Neutrons on Dormant Tomato Seeds. Paul Yagyu and Rosalind Morris. *Genetics*, v. 42, May 1957, p. 222-238.

The range of thermal neutron dosages used had a more pronounced effect than the range of X-ray dosages.

17143* Soil Variables for Use in Economic Analysis. David Weeks and J. Herbert Snyder. *Hilgardia*, v. 26, Aug. 1957, p. 497-520.

Tests for determining soil productivity characteristics.

17144* The Metabolism of the Organic Acids of Tobacco Leaves. XIV. On the Uptake of (+)-Tartaric Acid From Solutions in the Range pH 3 to pH 6. Hubert Bradford Vickery. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 943-949.

17145* Silvicultural Possibilities of Fire in Northeastern Washington. Russell K. LeBarron. *Journal of Forestry*, v. 55, Sept. 1957, p. 627-630.

An objective analysis of the controversial use of fire as a tool in silviculture.

17146* Planting Pines in Pocosins. Wm. D. Miller and T. E. Maki. *Journal of Forestry*, v. 55, Sept. 1957, p. 659-663.

Plantings of slash and loblolly pine have shown satisfactory growth in the wet upland bog areas when drainage is improved.

17147 Systemic Action of Captan Against *Botrytis Fabae* (Chocolate Spot of Broad Bean). Eunice J. Napier, A. Rhodes, Dorothy I. Turner, J. Tootill, and A. Dunn. *Journal of the Science of Food and Agriculture*, v. 8, Aug. 1957, p. 467-474.

A nomogram is provided to facilitate calculation of fiducial limits from a population of different variance.

17148* Techniques for Determining the Effect of Microorganisms on Insoluble Inorganic Phosphates. R. E. Rose. *New Zealand Journal of Science and Technology*, v. 38, sec. B, July 1957, p. 773-780.

Techniques for qualitative and quantitative determination of phosphate brought into solution by certain soil organisms. Carboxylic acid production in cultures where phosphate has been brought into solution is demonstrated by paper chromatography.

17149 An Inventory of Ohio Soils. *Ohio Department of Natural Resources, Division of Lands and Soil, Progress Report No.* 9, 1957, 27 p. (S599 Oh1.54i Contin.)

Major physical characteristics; soil management practices.

17150* Chemical Control of Vegetation on Pipe Line Rights-of-Way. Neil G. Wilson. *Pipe Line News*, v. 29, Sept. 1957, p. 22 + 3 pages.

Several herbicides are evaluated in different environments.

17151 The Trace Element Content of Plants. R. L. Mitchell. *Research*, v. 10, Sept. 1957, p. 357-362.

Factors affecting trace elements in plants.

17152* Iron Deficiency and the Growth of Pea Roots. R. Brown and J. V. Possingham. *Royal Society, Proceedings*, v. 147, ser. B, Sept. 12, 1957, p. 145-166.

An arrest in growth is due to an abrupt cessation in division that occurs at about seven days, and all the evidence indicates that this is the result of a disturbance confined to the meristem.

17153 Strontium-Calcium Movement From Soil to Man. C. L. Comar, R. Scott Russell, and R. H. Wasserman. *Science*, v. 126, Sept. 13, 1957, p. 485-492.

The physiological steps that are important in the movement of the two elements in the biosphere are described to provide a basis for an approach toward increasing assimilation of Ca with a corresponding reduction of Sr.

17154 Control of Screw-Worm Fly by Atomic Radiation. E. F. Knipling. *Scientific Monthly*, v. 85, Oct. 1957, p. 195-202.

Control of this pest in southeastern United States by release of sterilized males.

17155* Soil Organic Matter-Metal Complexes. I. Factors Affecting Retention of Various Cations. F. E. Broadbent and J. B. Ott. *Soil Science*, v. 83, June 1957, p. 419-427.

Experiments on the effect of cation concentration, type of cation, pH, and time of contact on complex formation by several metals.

17156* Improvements in Determining Cation-Exchange Capacity of Soils. A. Wahhab and M. Ahmad. *Soil Science*, v. 83, June 1957, p. 429-433.

Improved method for the determination of cation-exchange capacity is described and compared with several methods. Maintenance of extracting solution at 70 C for 2 hrs. is main differential feature of method.

17157* Amelioration of Alkali Soil by Chemicals in Combination With Organic-Matter-Like Weeds. S. P. Mitra and Hari Shanker. *Soil Science*, v. 83, June 1957, p. 471-474.

Sulfur, gypsum, and weeds used as ameliorating agents singly and by mixing with chemicals to determine their efficacies in reclamation of alkali soil found in nature.

17158* Sterilization of Soil by Irradiation With an Electron Beam, and Some Observations on Soil Enzyme Activity. A. D. McLaren, Lola Reshetko, and W. Huber. *Soil Science*, v. 83, June 1957, p. 497-502.

A treated Dublin soil showed urease but not trypsin activity.

17159* Some Aspects of the Use of Metal Chelates as Micronutrient Fertilizer Sources. A. Wallace, L. M. Shannon, O. R. Lunt, and R. L. Impey. *Soil Science*, v. 84, July 1957, p. 27-41.

Both soil and spray applications of metal chelates are promising methods of supplying micronutrients to plants. Reactions of chelates in soils and plants and soil vs. spray applications are considered.

17160* Uptake of Chelated Metals by Plants. P. C. DeKock and R. L. Mitchell. *Soil Science*, v. 84, July 1957, p. 55-62.

Divalent cations which are readily taken up by plants when present in solution in ionic form are not so readily absorbed when chelated, particularly with EDTA. Trivalent cations, which are taken up only in trace amounts when present in ionic solution, are readily taken up and translocated to the leaves when present in chelated form.

17161* (Russian.) Mechanism of the Biosynthesis of Isoprene Compounds. **Mekhanizm biosinteza izoprenovykh soedinenii. III.** New Data on Rubber and Carotene Antecedents in Kok-Saghyz. **Novye dannye o predshestvennikakh kauchuka i karotina v kok-sagyze.** I. G. Vyval'ko, et al. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 516-522.

Study of the distribution of C^{14} in fractions of rubber, resins, and carotene after introduction of the following compounds into kok-saghyz plants: acetic acid-1-C^{14}, glycocoll-1-C^{14}, alanine-1-C^{14}, alanine-2-C^{14}, acetoacetic acid-3-C^{14}, β-methylcrotonic acid-3-C^{14}, and glyceric acid-1-C^{14}.

See also: **17162** (biological research organizations); **17174** (turnip yellow Mosaic virus); **17182** (aliphatic fluorine insecticides); **17431** (plant growth regulators).

BIOCHEMISTRY AND BIOPHYSICS

17162 The Independent Research Organization and the Biological Sciences. Frank C. Croxton. *A.I.B.S., Bulletin*, v. 7, Apr. 1957, p. 13-15.

Availability of diversified, well-equipped research facilities and of specialists in all the physical and engineering science makes independent research organizations such as Battelle ideal centers of biological research, particularly in the development of instruments, methods, and materials for medical research and clinical pathology.

17163 An Ultracentrifugal Study on the Association- Dissociation of Glycinin in Acid Solution. Joseph J. Rackis, A. K. Smith, G. E. Babcock, and H. A. Sasame. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4655-4658.

Glycinin refers to phytate-free protein which precipitates from an aqueous extract of soybean meal at *p*H 5.1. Ultracentrifugal studies were conducted to discern the effect of *p*H, ionic strength, and influence of various salts on the behavior of glycinin in acid systems.

17164 The Binding of Calcium Ions by β-Lactoglobulin Both Before and After Aggregation by Heating in the Presence of Calcium Ions. C. A. Zittle, E. S. DellaMonica, R. K. Rudd, and J. H. Custer. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4661-4666.

The heating of β-lactoglobulin in the presence of Ca ions results in aggregation, but does not affect the amount of Ca bound in the p*H* region of 6.2 to 7.5. In the heated Ca-containing solutions aggregation appears to be determined by the net charge on the protein resulting from the binding of the positive Ca ions and is analogous to isoelectric aggregation.

17165 Effect of Binding of Ions and Other Small Molecules on Protein Structure. II. Isomerization of Ovalbumin, γ-Globulin and Serum Albumin in Acidic Media. III. Influence of Amino Acids on the Isomerization of Proteins. Robert A. Phelps and John R. Cann. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4672-4679.

17166 New Amine-Masking Groups for Peptide Synthesis. Frank C. McKay and Noel F. Albertson. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4686-4690.

Acid-catalyzed cleavage of a urethan, R'NHCOOR, leads to the formation of an amine salt, CO_2, and a product derived from the carbonium ion, R^+. Reports the use in peptide synthesis of urethans derived from *t*-butyl alcohol, *p*-methoxybenzyl alcohol, cyclopentanol, cyclohexanol, and diisopropylcarbinol. Some of these carboalkoxy protecting groups possess advantages over the well-known carbobenzoxy group.

17167 Synthetic Amebicides. II. 7-Dialkylaminoalkylaminobenz[c]Acridines and Other 7-Aminobenz[c]Acridines. Edward F. Elslager, Alexander M. Moore, Franklin W. Short, Marie Jo Sullivan, and Frank H. Tendick. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4699-4703.

These compounds were prepared by the condensation of a 7-chlorobenz[c]acridine with the appropriate amine or by ring closure of an N-(dialkylaminoalkyl)-2-(1-naphthylamino)-benzamide with phosphorus oxychloride. When tested against *Endamoeba histolytica in vitro*, against experimentally induced intestinal amebiasis in rats, and against amebic hepatitis in hamsters, these compounds were found to possess good activity.

17168 Polarographic Detection of 5-Pyrimidinyl Disulfides. Nydia G. Luthy and Bertha Lamb. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1454-1456.

Because certain 5-pyrimidinyl disulfides have shown small but significantly inhibitory effects on tumor growth, a method was required for monitoring the syntheses of these compounds in order to ascertain the presence or absence of the disulfide bond.

17169 Interferences With Biuret Methods for Serum Proteins. Use of Benedict's Qualitative Glucose Reagent as a Biuret Reagent. Richard J. Henry, Charles Sobel, and Sam Berkman. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1491-1495.

17170* Saturated Fatty Acids as Bacterial Antimetabolites. Merrill N. Camien and Max S. Dunn. *Archives of Biochemistry and Biophysics*, v. 70, Aug. 1957, p. 327-345.

Inhibition due to acids of approximately 12 to 20 carbons in length is shown to be the result of a potent antimetabolite effect, readily reversible by some unsaturated fatty acids and cyclopropane acid.

17171* (English.) **Synthesis and Metabolism of 2,2,17,17-Tetramethylstearic Acid. I.** Nils Tryding and Gunnel Westöö. *Arkiv för Kemi*, v. 11, no. 4, 1957, p. 291-305.

17172* The Fluorimetric Estimation of Adrenaline and Noradrenaline in Plasma. H. Weil-Malherbe and A. D. Bone. *Biochemical Journal*, v. 67, Sept. 1957, p. 65-72.

17173* Trace Elements in Human Tissue. I. A Semi-Quantitative Spectrographic Survey. S. R. Stitch. **II. Estimation of the Concentrations of Stable Strontium and Barium in Human Bone.** Eleanor M. Sowden and S. R. Stitch. *Biochemical Journal*, v. 67, Sept. 1957, p. 97-109.

17174* (English.) **The Sructure of Turnip Yellow Mosaic Virus: X-Ray Diffraction Studies.** A. Klug, J. T. Finch, and Rosalind E. Franklin. *Biochimica et Biophysica Acta*, v. 25, Aug. 1957, p. 242-252.

Studies of the virus and associated protein particles have led to new results concerning the packing of the virus particles in the crystal cell, and the arrangement of sub-units in a virus particle.

17175* Inherently Low Precision of Infectivity Titrations Using a Quantal Response. G. G. Meynell. *Biometrics*, v. 13, June 1957, p. 149-163.

Considerable variability in response is always present in an infectivity titration using quantal response.

17176* In Vitro Incorporation of C^{14}-DL-Leucine Into Normal and Leukemic White Cells. W. H. Baker, P. C. Zemecnik, and M. L. Stephenson. *Blood*, v. 12, Sept. 1957, p. 822-828.

Normal and leukemic white cells can incorporate C^{14}-DL-leucine into proteins in vitro. Cells from individuals with leukemia were able to incorporate significantly greater amounts of the amino acid, and were able to maintain this incorporation for a longer period of time than the control cells.

17177 Canadian Cancer Conference. Proceedings of the Second Canadian Cancer Research Conference, 1956. R. W. Begg, editor. v. II. 398 p. 1957. Academic Press, New York. (RC261 N21c)

Includes 22 papers concerning the cell, leukemia and chemotherapy, hormones and cancer, and immunity and basic mechanisms.

17178 Thrombin Properties. Edward Ronwin. *Canadian Journal of Biochemistry and Physiology*, v. 35, Sept. 1957, p. 743-758.

Enzymatic properties were examined and compared with those of two related enzymes, plasmin and trypsin. The effects of factors such as pH, substrate specificity, ionic strength, cations, anions, and organic reagents on enzymatic activity were studied.

17179* (English.) **Studies on Antibiotics and Related Substances. VI. Configurations of Isomeric O-Methylphenylserines and a New Route for the Synthesis of Chloramphenicol.** Tetsuo Suami and Sumio Umezawa. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 537-542.

17180 Codehydrogenases. II. A Synthesis of Nicotinamide Nucleotide. L. J. Haynes, N. A. Hughes, G. W. Kenner, and Alexander Todd. **III. A Synthesis of Diphosphopyridine Nucleotide (Cozymase), and Some Observations on the Synthesis of Triphosphopyridine Nucleotide.** N. A. Hughes, G. W. Kenner, and Alexander Todd. *Chemical Society, Journal*, Aug. 1957, p. 3727-3738.

17181 Biosynthesis of Polynucleotides. I. The Mode of Action of Ribonuclease. G. R. Barker, M. D. Montague, R. J. Moss, and Margaret A. Parsons. **II. The Synthesis and Properties of Phosphoryl Derivatives of Adenine Glucoside. III. Selective Phosphorylation of Adenosine.** G. R. Barker and G. E. Foll. *Chemical Society, Journal*, Aug. 1957, p. 3786-3800.

17182* Toxic Aliphatic Fluorine Compounds. F. L. M. Pattison. *Chemistry in Canada*, v. 9, Aug. 1957, p. 27-33.

Omega-monofluorinated aliphatic compounds and their application as insecticides and drugs.

17183* Estimation of Total Cholesterol in Serum by a Micro Method. K. J. Carpenter, A. Gotsis, and D. M. Hegsted. *Clinical Chemistry*, v. 3, pt. 1, Aug. 1957, p. 233-238.

Method permits estimation of total cholesterol in 0.02 ml. of serum without the need for micro apparatus.

17184* Symposia of the International Congress of Clinical Chemistry, Sept. 1956. *Clinical Chemistry*, v. 3, pt. 2, Suppl., Aug. 1957, p. 285-598.

The following subjects are covered: blood electrolytes, porphyrins, standardization in clinical chemistry, enzymes, and proteins.

17185* (French.) Analyzing Some Personal Experiments Produced by Ingesting Hallucinatory Mexican Agarics. **Analyse de quelques expériences personnelles produites par l'ingestion des agarics hallucinogènes du Mexique.** Roger Heim. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 597-603.

The chemical causes of the hallucinatory phenomena, whose extreme case is schizophrenia, were studied by a personal recording of the effects produced by separate ingestions of *Stropharia cubensis*, *Psilocybe caerulescens* var. *Mazatecorum*, and *Psilocybe mexicana*. Comparisons were made with other investigators' experiments.

17186* (English.) **Studies in the Sphingolipids Series. VIII. Synthesis of *N*-Benzoylsphingine Glucosides, Compounds Related to Cerebrosides.** M. Prošteník and N. Krvavica. **IX. Synthesis of DL-2-Amino-1,3,4-Trihydroxyoctadecane and Its C_1-Methyl Ether.** N. Ž. Stanaćev and M. Prošteník. *Croatica Chemica Acta*, v. 29, no. 2, 1957, p. 101-113.

17187* (Russian.) Influence of Oxygen Upon the Deoxyribonucleic Acid of Actinomyces Mycelium. **Vliianie kisloroda na dezoksiribonukleinovuiu kislotu mitseliia aktinomitseta.** N. S. Demianovskaia and M. P. Znamenskaia. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 856-858.

17188 Infrared Detector Aids Medical Diagnosis. W. E. Osborne. *Electronics*, v. 30, Oct. 1, 1957, p. 155-157.

Sensitive infrared detector circuits respond to minute temperature changes in head or body produced by emotion or deep thought. Technique has been applied to electroencephalography for study of the brain and as diagnostic detector for local inflammations in body. Similar equipment with positioning circuits is being developed for aircraft collision warning.

17189 Requirements for Production and Germination of Spores of Anaerobic Bacteria. Donald O. Hitzman, H. Orin Halvorson, and Tyunesia Ukita. *Journal of Bacteriology*, v. 74, July 1957, p. 1-7.

Development of media and methods for growing and harvesting anaerobic spores; determination of optimum conditions and minimal nutritional requirements for their rapid germination; effect of inhibitors on germination.

17190 Effect of Successive X-Irradiation of *Nocardia Corallina*. J. B. Clark and R. B. Webb. *Journal of Bacteriology*, v. 74, July 1957, p. 26-30.

17191 Induction of Bacterial Lysis by Penicillin. Louise E. Prestidge and Arthur B. Pardee. *Journal of Bacteriology*, v. 74, July 1957, p. 48-59.

Tests indicate that penicillin causes formation of an enzyme which attacks the cell membrane.

17192 Sonic Disruption of *Azotobacter Vinelandii*. Allen G. Marr and E. H. Cota-Robles. *Journal of Bacteriology*, v. 74, July 1957, p. 79-86.

Effects of intense sound waves. Results indicate that the chief mechanism of killing is disruption of the cell.

17193* The Solubility of Powdered Bone. B. E. C. Nordin. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 551-564.

Suggests that tissue fluid concentrations of calcium and phosphate could represent an equilibrium with the bone if the pH on the surface of the bone crystal was about 6.6 to 6.8.

17194* Isolation of Steroids From a Feminizing Adrenal Carcinoma. Hilton A. Salhanick and David L. Berliner. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 583-590.

17195* The Metabolism of Mucopolysaccharides in Animals. IV. The Influence of Insulin. Sara Schiller and Albert Dorfman. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 625-632.

Turnover of hyaluronic acid and chondroitinsulfuric acid of skin was studied in normal rats and in animals treated with adrenocortical hormones.

17196* An Unidentified Iodine Compound Formed by Incubation of Cell-Free Preparations of Tissue With Iodide-I^{131}. Alvin Taurog, W. Tong, and I. L. Chaikoff. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 759-772.

17197* Studies on Collagen. I. The Partial Purification, Assay, and Mode of Activation of Bacterial Collagenase. Paul M. Gallop, Sam Seifter, and Edward Meilman. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 891-906.

The collagenase elaborated by *Clostridium histolyticum* is used with ichthycol as a definitive substrate either in the form of a suspension or a solution.

17198* Carotenoids in Man. II. Fractions Obtained From Atherosclerotic and Normal Aortas, Serum, and Depot Fat by Separation on Alumina. David H. Blankenhorn. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 963-973.

Describes a method for micro-analysis of carotenoids in human blood serum, depot fat, and arterial wall.

17199* The Transport of Fatty Acids in the Blood. James F. Mead and Dorothy L. Fillerup. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 1009-1023.

Plasma and the erythrocyte lipides of rats were separated chromatographically after ingestion of carboxy-labeled methyl stearate, oleate, and linoleate.

17200* Proteins in Multiple Myeloma. VII. The Free Amino Groups of Bence-Jones Proteins. Frank W. Putnam and Aiko Miyake. *Journal of Biological Chemistry*, v. 227, Aug. 1957, p. 1083-1091.

Results suggest that Bence-Jones proteins are individually specific, thus raising a question as to the origin and possible metabolic function.

17201* Cross Reactions of Polyglucoses in Antipneumococcal Sera. III. Reactions in Horse Sera. Michael Heidelberger, Hans Jahrmärker, Bertil Björklund, and John Adams. **IV. Precipitation in Rabbit Antisera to Type IX and Type XII Pneumococcus.** Michael Heidelberger, Hans Jahrmärker, and Felix Cordoba. **V. Precipitation by Glycogens and Limit Dextrins.** Michael Heidelberger, Bertil Björklund, and Joseph Larner. *Journal of Immunology*, v. 78, June 1957, p. 419-434.

17202* Effective Passive Immunization of Mice Twelve Days After Intracerebral Inoculation of Type 2 Poliovirus. C. A. Evans, Velma C. Chambers, Susumu Hotta, and E. M. Wood. *Journal of Immunology*, v. 78, June 1957, p. 476-481.

In many animals specific anti serum of type 2 poliovirus terminated infection that had existed 12 days in the central nervous system.

17203 Lipids and the Problem of Atherosclerosis: A Survey. R. A. Morton. *Journal of the Science of Food and Agriculture*, v. 8, Aug. 1957, p. 445-457.

Concludes that more research may lead to a rational preventive approach before long.

17204 Tall Oil: Isolation of the Branched-Chain Fatty Acid (+)-14-Methylhexadecanoic Acid and of the Straight-Chain Acid Palmitic Acid. R. P. Hansen and N. June Cooke. *Journal of the Science of Food and Agriculture*, v. 8, Aug. 1957, p. 482-485.

Investigation of a sample of New Zealand tall oil.

17205 Steroids. LXXXVI. Synthesis of Monofunctional 11-Ketones. Franz Sondheimer, E. Batres, and G. Rosenkranz. **LXXXVII. Preparation of Some Estrone-Ethers.** F. A. Kincl, H. J. Ringold, and G. Rosenkranz. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1090-1092, 1127-1128.

17206 Hypotensive Agents. VII. Azabicyclo [3.2.0]heptane Derivatives. Leonard M. Rice and Charles H. Grogan. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1100-1103.

17207 4-[4-(*p*-Dimethylaminophenyl)-1,3-Butadienyl] Quinoline. Carl Tabb Bahner and John N. Fain. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1109-1110.

Compound is investigated as an anti-tumor agent.

17208 Occupational Diseases of the Skin. Louis Schwartz, Louis Tulipan, and Donald J. Birmingham. 3rd Ed. 981 p. 1957. Lea & Febiger, Philadelphia. (RL71 S95o3)

Industrial processes causing dermatitis; methods of prevention and treatment.

17209* Common Errors in Obtaining and Evaluating Experimental Data. Maurice H. Belz. *Physics in Medicine and Biology*, v. 2, July 1957, p. 3-16.

Reviews the contribution which statistics and statisticians can make to the design of experiments and the analysis of experimental results in biology and medicine.

17210 Proceedings of the Third National Cancer Conference. 961 p. 1957. J. B. Lippincott Co., Philadelphia. (RC261 N21p3)

Papers presented at a conference at Detroit, Mich., June 1956.

17211 Progress in the Chemistry of Fats and Other Lipids. R. T. Holman, W. O. Lundberg, and T. Malkin, editors. 289 p. 1957. Pergamon Press, New York. (QP751 P94 Vis.)

Constitution and synthesis of fatty acids; the naturally occurring acetylenic acids; synthesis of glycerides; lipid waxes; synthesis of phospholipids; lecithinases; lipid dynamics in adipose tissue; dilatometry; ultra-violet spectrophotometry of fatty acids.

17212* (Polish.) Pharmaceuticals From Furfural. **Srodki leczniecze pochodne furfuralu. III.** Preparation of N-(5-Nitro-2-Furfurylidene)-3-Amino-2-Oxazolidone. **Otrzymywanie N - (5-nitro - 2 - furfurylideno) - 3-amino-2-oksazolidonu.** A. Świrska and J. Lange. *Przemysł Chemiczny*, v. 13, no. 7, July 1957, p. 400-401.

17213 Modern Separation Techniques for Natural Compounds. T. H. Farmer and J. S. Fawcett. *Research*, v. 10, Sept. 1957, p. 350-356.

Survey of electrophoresis, extraction columns, dialysis, adsorption, and ion exchange methods.

17214* Cholesterol as a Carcinogen. I. Hieger. *Royal Society, Proceedings*, v. 147, ser. B, Aug. 24, 1957, p. 84-89 + 1 plate.

Highly purified cholesterol (Schwenk process), dissolved in olive oil by heating on the water-bath, was injected subcutaneously into 224 stock mice. Fourteen sarcomas were induced at the site of injection. In one group of these mice, 11 sarcomas arose in 115 mice, the percentage when calculated on the number of mice which survived to at least the minimal latent period being 14%. There is no evidence that purification impairs the carcinogenic potency of cholesterol.

17215* The Cytochrome System of the Cecropia Silkworm. I. Spectroscopic Studies of Individual Tissues. II. Spectrophotometric Studies of Oxidative Enzyme Systems in the Wing Epithelium. D. G. Shappirio and C. M. Williams. *Royal Society, Proceedings*, v. 147, ser. B, Sept. 12, 1957, p. 218-246.

17216* Virus Interference. I. The Interferon. A. Isaacs and J. Lindenmann. **II. Some Properties of Interferon.** A. Isaacs, J. Lindenmann, and R. C. Valentine. *Royal Society, Proceedings*, v. 147, ser. B, Sept. 12, 1957, p. 258-273.

17217 The Specificity of Antibodies. S. J. Singer. *Scientific American*, v. 197, Oct. 1957, p. 99 + 4 pages.

Research is beginning to show how these body proteins "recognize" and react with particular foreign molecules and not with others that have very nearly the same chemical structure and properties.

17218 Effects of Chronic Exposure to X-Rays on a Steady-State Population of *Saccharomyces Cerevisiae*. Graeme Perry Welch. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3763, June 1957, 60 p. (UF767 U3u Contin.)

17219 Formation of >C=O Bonds in the Radiation-Induced Oxidation of Protein in Aqueous Systems. Michael E. Jayko and Warren M. Garrison. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3872, July 1957, 5 p. (UF767 U3u Contin.)

Studies of the reactions of irradiated pepsin solutions with 2,4-dinitrophenylhydrazine indicate that formation of the >C=O bond is a principal chemical effect of the attack of hydroxyl radicals on pepsin in oxygenated solution.

17220 Radiological Laboratory. Semiannual Report for Period Ending June 30, 1957. *University of California, School of Medicine (U. S. Atomic Energy Commission)*, UCSF-15, Aug. 1957, 28 p. (UF767 Un3.1ucs Contin.)

Use of calorimeter; chemical dosimetry; synchrotron operations. Effect of irradiation on mice and various microorganisms. Current status of patients treated for hyperthyroidism with radioiodine.

See also: **17325** (separation of fermentation acids); **17380** (synthesis of antimetabolites); **17418** (use of ion exchangers); **17428** (trichomonacidal and fungicidal agents).

CERAMICS AND CONCRETE

17221 (English.) **Concrete Deterioration of a Foundation.** G. M. Idorn. *Acta Polytechnica (Civil Engineering Series)*, v. 4, no. 3, 1957, 48 p. (T1 Ac81 Vis.)

Investigation of deterioration of a Copenhagen silo foundation included field investigations, petrographic examination of selected concrete specimens, chemical analyses of ground-water samples from the site, chemical analyses of selected concrete samples, and optical measurements on secondary compounds in the concrete.

17222 Effect of Some Ceramic Techniques on the Piezoelectric Properties of Barium Titanate. E. J. Brajer. *American Ceramic Society Bulletin*, v. 36, Sept. 1957, p. 333-336.

Marked reductions in piezoelectric coupling were found to result from one mole % additions of SiO_2, MgO, Fe_2O_3, and excess TiO_2.

17223 Use of Nepheline Syenite in High-Talc-Ball Clay Bodies. Robert C. Wilson and C. J. Koenig. *American Ceramic Society Bulletin*, v. 36, Sept. 1957, p. 347-351.

Small percentages of variously ground nepheline syenite were incorporated in a 60% talc-40% ball clay type body. Significantly improved properties were secured by using very finely ground nepheline syenite, whereas but little improvement was found by using nepheline syenite ground to 270 mesh specifications.

17224 Thermal Conductivity. XIII. Effect of Microstructure on Conductivity of Single-Phase Ceramics. F. R. Charvat and W. D. Kingery. *American Ceramic Society, Journal*, v. 40, Sept. 1957, p. 306-315.

The thermal conductivity of Al_2O_3, MgO, TiO_2, and CaF_2 single crystals and single-phase polycrystalline aggregates of controlled microstructure was measured between 0 and 1000 C.

17225 Cermets. II. Wettability and Microstructure Studies in Liquid-Phase Sintering. N. M. Parikh and M. Humenik, Jr. *American Ceramic Society, Journal*, v. 40, Sept. 1957, p. 315-320.

17226 Phase Relationships in the System Zirconia-Thoria. Pol Duwez and Eugene Loh. *American Ceramic Society, Journal*, v. 40, Sept. 1957, p. 321-324.

17227* Laboratory Tests of Portland Blast-Furnace Slag Cements. Bryant Mather. *American Concrete Institute, Journal*, v. 29, Sept. 1957, p. 205-232; *ACI Proceedings*, v. 54, 1957, p. 205-232.

Properties and performance of samples from various mills.

17228 Purification of Nuclear Fuels by Melting in Refractory Oxide Crucibles. H. M. Feder, N. R. Chellew, and M. Ader. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5255, Mar. 1954, 49 p. (UF767 Un3.1an Contin.)

Properties and use of refractory oxide crucibles for melting irradiated uranium.

17229 A Loading System for Creep Studies of Concrete. C. H. Best, D. Pirtz, and M. Polivka. *ASTM Bulletin*, 1957, no. 224, Sept., p. TP164-TP167.

This hydraulic system insures uniform stress distribution over the entire cross-sectional area of a test specimen.

17230* (Russian.) Technology of High-Strength, Quick-Setting Concretes. **Nekotorye voprosy tekhnologii vysokoprochnykh bystrotverdeiushchikh betonov.** Ia. E. Iokhel'son and O. V. Kuntsevich. *Beton i Zhelezobeton*, 1957, no. 8, Aug., p. 325-329.

Development of extra-high-strength concrete for use in tunnels.

17231 (German.) Grain Size and Pore Size Distribution. **Korngrössenverteilung—Porengrössenverteilung.** K. Konopicky and G. Engel. *Berichte der Deutschen Keramischen Gesellschaft*, v. 34, Aug. 1957, p. 270-273.

Effect of grain size in silica and fire-clay bodies. Relation between size of pores and amount of coarse grains. Effects of grain size on gas permeability and compressive strength.

17232 Problems of Temperature Measurement in the Drying and Firing of Bricks. T. Shingler. *British Ceramic Society, Transactions*, v. 56, Aug. 1957, p. 402-422.

Thermocouples of Ni-Cr/Ni-Al were found satisfactory in the application of control by temperature measurement in continuous kilns. The elements had to be placed at points at which the temperature was critical. The effect on the elements of convective heat-exchange or radiation had to be considered when measuring the temperature of solids or gases.

17233* Black Coring in Structural Clay Products. II. Wayne E. Brownell. *British Clayworker*, v. 66, Sept. 1957, p. 166-169.

Effetcs of time, temperature, firing atmosphere, and additions of ammonium compounds. (To be continued.)

17234 Reforming, Bending and Fire Polishing of Glassware. Carl P. Mann. *Ceramic Industry*, v. 69, Sept. 1957, p. 110 + 4 pages.

Methods and equipment involved in these processes.

17235 The Oxides of Uranium. VIII. The System Uranium Dioxide-Yttria. I. F. Ferguson and P. G. T. Fogg. *Chemical Society, Journal*, 1957, Aug., p. 3679-3681.

A range of solid solutions, with pseudo-fluorite structures, exists between 0 and 78 moles % of $YO_{1.5}$, whose cell constant is a non-linear function of composition. Between 78 and 96 moles % of $YO_{1.5}$ there is an immiscibility gap. Beyond 96 moles % of $YO_{1.5}$ a solid solution range occurs based upon the Tl_2O_3 structure. Density measurements show that all these solid solutions have an anion-vacancy structure.

17236 Swedish Gas Concrete Makes Its U. S. Debut. *Chemical Week*, v. 81, Oct. 5, 1957, p. 79 + 2 pages.

Describes operations at the Denver plant for low-density concrete production by the Swedish Durox process.

17237* (Russian.) Equilibrium Between Two Liquid Phases in the Simplest Fluorine-Silicate Systems. **Ravnovesie dvukh zhidkikh faz v prosteishikh ftor-silikatnykh sistemakh.** Ia. I. Ol'shanskii. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1246-1249.

Study of the formation of two liquid phases in CaF_2-CaO-SiO_2 and CaF_2 – Al_2O_3 – SiO_2 systems.

17238 Forming Ceramic Shapes Using Hydrostatic Pressing. P. Best and E. Proudfoot. *Industrial Chemist*, v. 33, Sept. 1957, p. 448 + 4 pages.

Process for manufacturing refractory ware gives products of high purity and is flexible as regards the shapes which can be made and the materials which can be used.

17239* The Production and Properties of Synthetic Corundum. C. Barta. *Industrial Diamond Review*, v. 17, Aug. 1957, p. 147 + 4 pages.

17240* (Russian.) Application of Sodium Fluosilicate in Glass Manufacture. **Primenenie kremneftoristogo natriia v steklodelii.** A. N. Dauval'ter. *Legkaia Promyshlennost'*, v. 17, no. 8, Aug. 1957, p. 23-25.

Sodium fluosilicate has many valuable properties, a more stable chemical composition, and is much cheaper than cryolite, therefore it can be broadly applied in the glass industry.

17241* (Russian.) New Method of Laying the Bottom of the Basic Open-Hearth Furnace. **Novyi metod kladki podin osnovnykh martenovskikh pechei.** M. S. Sokolov and P. P. Semenenko. *Metallurg*, 1957, no. 8, Aug., p. 23-26.

New lining material consisting of a mixture of magnesite powder with slag; technology of using it in forming the bottom of basic open-hearth furnace. This material is long lasting and not as expensive as magnesite or chrome-magnesite.

17242* (Russian.) Aluminum-Chromite Refractory Materials for Lining of Steel Teeming Ladles. **Glinozemistokhromitovye ogneupory dlia futerovki stalerazlivochnykh kovshei.** V. A. Bron and P. A. Lande. *Metallurg*, 1957, no. 9, Sept., p. 17-18.

Experiments with aluminum chromite lining bricks of the following chemical composition (in %): Al_2O_3-77.38, SiO_2-6.70, Cr_2O_3-10.81, Fe_2O_3-1.17, MgO-1.02, R_2O-3.29. Physico-chemical properties. Comparison with a fireclay lining (7.6 smeltings); average durability of this lining is 20-22 smeltings.

17243 Non-Metallics for Missiles. John H. Lux and Robert L. Noland. *Missiles and Rockets*, v. 2, Sept. 1957, p. 137 + 4 pages.

Properties of proprietory materials, such as Rocketon and Missileon, made of combinations of metals, ceramics, and plastics.

17244* (Russian.) Production of Ceramic High-Alumina Blocks for Lining Glass Furnaces. **Tekhnologiia proizvodstva keramicheskikh vysokoglinozemistykh brus'ev dlia kladki vannykh pechei.** B. G. Koldaev, B. V. Ivanov, and V. V. Vladychenskaia. *Ogneupory*, v. 22, no. 8, 1957, p. 340-345.

Preparation and properties of mullite-bonded blocks having low apparent porosity ($< 1\%$) and high resistance to attack by molten glass.

17245* (Russian.) Service Life of Carbon Lining of an Electric Arc Furnace. **Sluzhba uglerodistoi futerovki v elektrodugovykh fliusoplavil'nykh pechakh.** A. A. Pirogov and E. N. Leve. *Ogneupory*, v. 22, no. 8, 1957, p. 345-348.

Advantages of a rammed C lining because of its stability and more uniform surface wear. Thermal and electric losses caused by water cooling.

17246* (Russian.) Production and Service Life of Ladle Brick Containing a High Percentage of Chamotte. **Proizvodstvo i sluzhba mnogoshamotnogo kovshevogo kirpicha.** N. N. Kirillova, Iu. V. Radina, and D. Ia. Sakovskii. *Ogneupory*, v. 22, no. 8, 1957, p. 348-354.

17247* (Russian.) Production of Dense, Constant-Volume Alumosilicate Refractories for Lining Blast Furnaces. **Tekhnologiia proizvodstva vysokoplotnykh i ob'emopostoiannykh aliumosilikatnykh ogneuporov dlia kladki domennykh pechei.** S. A. Zhikharevich and I. A. Getman. *Ogneupory*, v. 22, no. 8, 1957, p. 355-367.

Production of clay refractories of 10-12% porosity. Possible porosity reduction to 8-10% by adjusting grain size of the body.

17248 Irradiation Effects in Borosilicate Glass. Bernhard Gross. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 368-373.

Irradiation of thick samples with high-energy electrons introduces space charges into the dielectric, the decay of which is extremely slow at room temperature. The charged dielectric shows a behavior similar to that of an electret.

17249 Diffusion of Carbon Atoms in Natural Graphite Crystals. Manuel A. Kanter. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 655-663.

The greatest part of the flow of atoms into the crystals occurred by the process of volume diffusion at temperatures above 2150 C.

17250 Some Aspects of the Physics and Chemistry of Cement. Stephen Brunauer. *Portland Cement Association Research Department Bulletin* 80, 1957, p. 428-468. (TP883 P83b Vis.)

Properties of cement-water system.

17251 Studies of "Salt" Scaling of Concrete. George J. Verbeck and Paul Klieger. *Portland Cement Association Research Department Bulletin* 83, June 1957, 13 p. (TP883 P83b Vis.)

Effect of de-icers on the surface scaling of non-air-entrained and air-entrained concretes, each made with two different coarse aggregates, cured differently, and tested under a variety of scale procedures.

17252 New Low-Expansion Ceramic for Thermal Shock. Herbert Schwartz. *Product Engineering*, v. 28, Sept. 30, 1957, p. 70-73.

Properties of "HT-2", a new modified aluminum silicate material.

17253 An Unusual Form of Neodymium Silicate. R. C. Vickery and R. Sedlacek. *Research*, v. 10, Sept. 1957, p. 371-372.

Crystals are not attacked by warm HF, H_2SO_4, HCl, HNO_3, or concentrated alkalies.

17254* (French.) Effect of Air Moisture on the Processes of Trituration and Separation of Solids. **L'influence de l'humidité atmosphérique sur processus de trituration et de séparation dans les solides.** J. Arvid Hedvall. *Société Chimique de France, Bulletin*, 1957, no. 8-9, Aug.-Sept., p. 991-994.

Effect of air humidity on screening quartz, feldspar, and chamotte.

17255 The Corrosion of Superstructure Refractories by Batch Materials. T. S. Busby. *Society of Glass Technology, Journal*, v. 40, Dec. 1956, p. 499T-508T.

Study of glass tank blocks. Shows that boric oxide is less corrosive than sodium carbonate or borax, silica materials are badly attacked; characteristics of zircon, zirconia mullite, and fusion-cast zirconia-corundum are also presented.

17256 Engineering Problems in the Development of Glass Betatron Toroids. S. J. Morrison. *Society of Glass Technology, Journal*, v. 40, Dec. 1956, p. 520T-541T.

Reviews three different types of toroidal glass vacuum chambers which have been developed for use in betatrons operating at 16 and 20 MeV.

17257* (Russian.) Titanium Glass as a Dielectric Material for Condensers. **Titanovoe steklo kak dielektrik kondensatorov.** I. I. Kitaigorodskii and V. A. Blinov. *Steklo i Keramika*, v. 14, no. 8, Aug. 1957, p. 4-7.

Effects of composition on properties of various glasses used in transformers.

17258* (Russian.) Effect of Sintering Temperature of the Cement Mixture on the Microstructure and Phase Composition of High Magnesium Clinkers. **Vliianie temperatury obzhiga tsementnoi shikhty na mikrostrukturu i fazovyi sostav vysokomagnezial'nykh klinkerov.** P. P. Budnikov and Kh. S. Vorob'ev. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 541-549.

Study of magnesia cements prepared at 1450-1500 C: their physical and mechanical properties, microstructure, phase composition, and other qualities.

17259 Alumina-Base Cermets. John W. Lindenthal, James G. Stradley, and Thomas S. Shevlin. *Wright Air Development Center Aeronautical Research Laboratory, WADC Technical Report* 54-173, pt. 4, May 1957, 14 p. (TL507 Un3.18w Vis.)

Oxide wetting studies upon alumina-base ceremts were made by prereacting the alumina with more easily reducible oxides such as those of Cr, Ni, and Co. When compounded into cermet compositions, these mixed oxides promoted wetting or reaction with the metallic constituent. Specimens containing 50 vol. % of oxide were produced exhibiting strengths comparable to that of the metal alone.

17260* (Russian.) Measuring the Heat Conductivity of Refractory Materials in Vacuum. **Opredelenie teploprovodnosti ogneuporov v vakuume.** D. M. Shakhtin and I. I. Vishnevskii. *Zavodskaia Laboratoriia*, v. 23, no. 8, Aug. 1957, p. 927-929.

Description of apparatus suitable for use at high temperature. Possible error is about 20%.

17261* (Russian.) Atomic Chains and Fine Structures of Glass. **Atomnye tsepi i tonkoe stroenie stekla.** *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1521-1533.

Application of quantum theory of heat capacity in study of glass structure.

See also: **17797** (flow of clay through orifices); **17955** (impulse testing of concrete beams); **18023** (cooling of glass furnaces); **18183** (ceramic cutting tools); **18188** (ceramic cuttings tools); **18462** (physics of glass and cement).

CHEMICAL ENGINEERING

17262* Oxidation-Reduction Potential Measurements Applied to Iron Removal. James G. Weart and Gerald E. Margrave. *American Water Works Association, Journal*, v. 49, Sept. 1957, p. 1223-1233.

Discusses the application of oxidation-reduction potential measurement to water treatment for iron removal.

17263* Liquids and Solids Mixed by Automatic Proportioning System. *Automation*, v. 4, Oct. 1957, p. 60-61.

17264* Evaporator Heat Balance and Material Calculations. N. J. Hassett. *British Chemical Engineering*, v. 2, Sept. 1957, p. 478-483.

A complex multiple-effect evaporator system is shown to function as a number of superimposed ideal evaporation sequences. This method enables an accurate analysis of a complex system to be made in a succinct manner.

17265* Instrumentation for Multi-Effect Evaporators. M. H. Grimes. *British Chemical Engineering*, v. 2, Sept. 1957, p. 484-488.

Ways in which instrumentation can be applied to integrate the operation of an individual evaporator with that of others and with the demands of the factory.

17266* Submerged Combustion Evaporators. J. Austin. *British Chemical Engineering*, v. 2, Sept. 1957, p. 490-494.

Industrial applications for the submerged combustion evaporator are described, including that of difficult effluents such as those issuing from coking, Ti oxide, and pickling plants.

17267* Liquid Atomisation in Chemical Engineering. II. Rotary Atomisers. R. P. Fraser, E. P. Eisenklam, and N. Dombrowski. *British Chemical Engineering*, v. 2, Sept. 1957, p. 496-501.

Applications, design features, and operating principles of rotary atomizers. Drop formation and drop sizes.

17268* Dehydrating Saskatchewan Glauber's Salt. R. V. Tomkins and J. W. Spyker. *Canadian Chemical Processing*, v. 41, Sept. 1957, p. 55 + 5 pages.

Economical production of salt cake depends on dehydration of Glauber's salt by precipitation at transition point.

17269 Circulation and End Effects in a Liquid Extraction Spray Column. S. D. Cavers and J. E. Ewanchyna. *Canadian Journal of Chemical Engineering*, v. 35, Oct. 1957, p. 113-128.

Acetic acid was transferred between a continuous water phase and a dispersed methyl isobutyl ketone phase, and concentration profiles for each phase were obtained. These were used to calculate over-all capacity coefficients.

17270 Generalized Gas Heat Capacities. Wallace R. Gambill. *Chemical Engineering*, v. 64, Oct. 1957, p. 283-288.

Procedures for quick estimates for natural gas, petroleum and hydrocarbon vapors, including ways to account for pressure dependence.

17271 Flow Behavior in Fluidized Systems. Max Leva. *Chemical Engineering*, v. 64, Oct. 1957, p. 289-293.

Basic data to help predict when fluidization starts, how it behaves, and what happens to the bed.

17272 Al Alloy Variety Spurs Use in Exchangers. R. W. Flournoy. *Chemical Engineering*, v. 64, Oct. 1957, p. 318 + 3 pages.

Multiplicity of Al alloys, including new high-strength types, gives wide choice of properties and equipment designs for process heat exchangers.

17273 What's New in Industrial Uses of Unsaturated Fatty Acids. S. A. Harrison, R. B. Kron, and H. A. Hamilton. *Chemical Processing*, v. 20, Oct. 1957, p. 88-93.

Includes data on cosumption, broken down by industry.

17274 Application of Acidity Functions to the Mechanisms of Acid-Catalyzed Reactions. F. A. Long. *Chemical Society, Proceedings*, 1957, Aug., p. 220-225.

17275 Heavy-Water Process Takes a Big First Step. *Chemical Week*, v. 81, Oct. 5, 1957, p. 31 + 3 pages.

Presents as much as can be told of A.E.C.'s new process for heavy-water production.

17276* (English.) **Calculation of Minimum Consumption of Fresh Solvent in Multiple Extraction.** M. Vender. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 697-704.

A graphical method is proposed for the calculation of the minimum consumption of fresh solvent for the case where the distribution coefficient is a known function of the concentration of the extracted substance in the raffinate.

17277* Purifying Brackish Water by Electro-Dialysis. *Engineer*, v. 204, Sept. 13, 1957, p. 390-391.

Details of a British plant for purifying 40 tons of water daily.

17278* (French.) The Spraypak Packing and Its Application to Absorption. **Le garnissage "Spraypak" son application à l'absorption.** R. Papin and J. Caron. *Genie Chimique (Supplement to Chimie & Industrie)*, v. 78, Aug. 1957, p. 46-53.

Advantages from the operation of a Spraypak in gas-water and gas-oil systems.

17279 Liquid-Liquid Extraction of Zinc Chloride From Sulfate With Furfural. Leo Garwin and James M. Winterbottom. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1355-1360.

A commercial process which can yield $ZnCl_2$ directly is proposed for separating aqueous mixtures of these salts.

17280 Thermal Diffusion Efficiency and Separation of Liquid Petroleum Fractions. James R. White and Albert T. Fellows. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1409-1418.

Molecular configuration and not equipment design may govern heat requirements for separating liquid petroleum fractions by thermal diffusion.

17281 Equilibria for the System Ethanolamines-Hydrogen Sulfide-Water. Kenton Atwood, M. R. Arnold, and R. C. Kindrick. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1439-1444.

Where acidic impurities must be removed from commercial gases, this system of calculation may give better equipment design.

17282 Heat Transfer to Boiling Methanol—Effect of Added Agents. A. J. Lowery, Jr. and J. W. Westwater. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1445-1448.

Nucleation, not interfacial tension, may explain why additives or foreign particles change boiling curves for liquids.

17283 Unit Processes Review. *Industrial and Engineering Chemistry*, v. 49, pt. 2, Sept. 1957, p. 1459-1576.

Includes articles on alkylation, amination by reduction, combustion, decomposition of hydrocarbons, esterification, fermentation, halogenation, hydration and hydrolysis, hydrogenation and hydrogenolysis, isomerization, nitration, polymerization, pyrolysis of coal and shale, sulfonation and sulfation, and Friedel-Crafts acylations.

17284 Materials of Construction Review. *Industrial and Engineering Chemistry*, v. 49, pt. 2, Sept. 1957, p. 1577-1662.

Includes articles on Al alloys, carbon and graphite, ceramics, elastomers, fibers, hard rubber, Pb and its alloys, less common metals, Ni including high-Ni alloys, plastics, protective coatings, stainless steels including other ferrous alloy, tin and its alloy, and Ti.

17285 The Autothermic Cracking of Light Hydrocarbons. P. H. Calderbank, V. P. Hovnanian, and F. D. F. Talbot. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 425-431.

Ethane and propane were autothermally cracked by admixture with air in a reactor packed with alundum spheres. It has proved possible to predict the performance of such a reactor operating under varying air to gas ratios and feed rates.

17286 How Isotopes Work for Refiners. George Weber. *Oil and Gas Journal*, v. 55, Sept. 23, 1957, p. 91-100.

The many present applications and vast future applications of isotopes are reviewed.

17287 Ethylene Oxide by the Direct Oxidation Process. I. Peter W. Sherwood. *Oil and Gas Journal*, v. 55, Sept. 30, 1957, p. 80-83.

Some of the objectives and problems involved.

17288 The "H-Oil" Process. H. Pichler, M. Chervenak, C. A. Johnson, M. C. Sze, and J. F. Campagnolo. *Oil and Gas Journal*, v. 55, Sept. 30, 1957, p. 109 + 3 pages.

Process reduces refinery residual stocks to the plant fuel requirement and converts the remainder into valuable distillate products. It has the flexibility to produce varying quantities of each distillate product depending on changes in demand.

17289 Petroleum and Its Products. J. H. van der Have and C. G. Verver. 421 p. 1957. Sir Isaac Pitman & Sons, Ltd., London. (TP690 H29p)

Reviews the whole field of petroleum production and refining, describing the exploration and drilling for petroleum, composition of the various kinds of crude oil, manufacture of the numerous derivatives that are made from it, and properties that these products should possess.

17290 Thermodynamic Properties of Pure and Mixed Hydrocarbons. I. Latent Heats of Vaporization for Pure Hydrocarbons. II. Latent Heats of Vaporization for Hydrocarbon Mixtures. Merk Hobson and James H. Weber. *Petroleum Processing*, v. 12, Aug. 1957, p. 43-47; Sept. 1957, p. 153-157.

17291 How You Can Hydrocrack Those Asphaltic Crudes. J. Varga, et al. *Petroleum Refiner*, v. 36, Sept. 1957, p. 198-200.

Data on up-grading of asphaltic crudes by cracking in the presence of hydrogen and a catalyst.

17292 This New Process Handles Residuals. H. Pichler, et al. *Petroleum Refiner*, v. 36, Sept. 1957, p. 201-204.

"H-Oil" process hydrogenates heavy residual oil into useful products.

17293 Hydrocrack and Gasify to Upgrade Stocks. E. B. Shultz, Jr. and H. R. Linden. *Petroleum Refiner*, v. 36, Sept. 1957, p. 205-210.

Cracking to produce aromatics for motor fuel blending.

17294 Fluid Coking Shifts Product Distribution. R. M. Cornforth. *Petroleum Refiner*, v. 36, Sept. 1957, p. 211-214.

Use to change residual fuel oil into high octane gasoline.

17295 The New Look in Butane Isomerization. J. A. Samaniego. *Petroleum Refiner*, v. 36, Sept. 1957, p. 223-225.

Description of improvements made in liquid-phase refining process.

17296 Nuclear Reactors Seen as Process Tool. Mark R. Dusbabek. *Petroleum Refiner*, v. 36, Sept. 1957, p. 243-248.

Attributes of nuclear reactors; possibilities for using a reactor in petroleum processing.

17297* Manufacture of Lithium Soap Grease and Calcium Soap Grease by Electric Heating. D. F. Rhodes. *Spokesman*, v. 21, Sept. 1957, p. 18-24.

17298 Loss in Production Due to Periodic Feed Concentration. D. W. Burton. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1341, Sept. 1957, 61 p. (UF767 Un3.1k Contin.)

Method for determining loss in production for a general series-type plant when the feed concentration undergoes a periodic variation.

17299* Water Softening. I. Causes of Hardness and Reasons for Reduction. George E. Symons. *Water & Sewage Works*, v. 104, Sept. 1957, p. 397- 400.

Hardness types and measurements; costs to consumers. (To be continued.)

See also: **17439** (bottle-washing sequestrants); **17842** (refining of generator gas); **17843** (control of gasoline characteristics); **17904** (chemical literature guide); **18519** (treatment of refinery wastes); **18521** (water supply and treatment bibliography); **18573** (use of strain gages for digester weighing).

CHEMISTRY—ANALYTICAL

17300* Separation and Identification of Terpenic Compounds in Puerto Rican Bay Oil, *Myrcia Acris*, Using Chromatographic Methods. Naoemí García de Martínez Nadal. *American Perfumer and Aromatics*, v. 70, Sept. 1957, p. 51-55.

17301* Determination of Indium in Rocks and Minerals by Radioactivation. A. A. Smales, J. Van R. Smit, and H. Irving. *Analyst*, v. 82, Aug. 1957, p. 539-549.

Ultimate sensitivity with 49-day indium-114 is 8×10^{-10} g. The 54-minute isomer indium-116 gives the greater sensitivity of 5×10^{-12} g.

17302* Photometric Determination of Molybdenum in Tungsten Ores. P. G. Jeffery. *Analyst*, v. 82, Aug. 1957, p. 558-563.

The suppression by citric acid of the formation and subsequent extraction of the complex of W with toluene-3 : 4-dithiol is used to permit the determination of Mo.

17303* The Use of Fusion Reactions With Benzoyl Peroxide in Organic Spot-Test Analysis. F. Feigl and E. Silva. *Analyst*, v. 82, Aug. 1957, p. 582-586.

17304* (English.) **Some Considerations Governing the Choice of Method for Purity Determinations by Cryoscopy.** E. F. G. Herington. *Analytica Chimica Acta*, v. 17, July 1957, p. 15-22.

Suggests the use of a comparative technique for the determination of purity by freezing point measurement. A new method for the determination of purity by melting curves is described.

17305* (English.) **Calculation of Cryoscopic Data.** Charles Proffer Saylor. *Analytica Chimica Acta*, v. 17, July 1957, p. 36-42.

Proposes methods for decreasing errors caused by scattered data and failure to recover from supercooling.

17306* (English.) **Comparison of Cryoscopic Determinations of Purity of Benzene by Thermometric and Calorimetric Procedures.** A. R. Glasgow, Jr., et al. *Analytica Chimica Acta*, v. 17, July 1957, p. 54-79.

Differences between analyses of three samples are roughly of the order of the statistically estimated uncertainties of the averages and less than deviations determined between individual experiments by one method.

17307* (English.) **Experimental Methods for the Determination of Purity by Cryoscopy in Current Use at the Chemical Research Laboratory, Teddington.** R. Handley. *Analytica Chimica Acta*, v. 17, July 1957, p. 115-124.

17308 Square Wave Titrimetry. H. A. Laitinen and Larry C. Hall. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1390-1398.

Square wave titrimetry was applied to redox, precipitation, and complex formation reactions. Iodine-arsenite, ferrous-cerium(IV), and ferro-cyanide-cerium(IV) reactions gave successful titrations. Equimolar mixtures of iodide, bromide, and chloride were titrated with silver nitrate to yield three successive end points. Cyanide can be titrated to silver(I) cyanide complex in the presence of ammonia.

17309 Quantitative Radiochemical Methods for Determination of the Sources of Natural Radioactivity. John N. Rosholt, Jr. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1398-1408.

Alpha activity measured by scintillation counting is used for determination of Pa-231, Th-232, Th-230, and Ra-226. The chemical procedures for the separations of the specific elements are described, as well as the measurement techniques used to determine the abundances of the individual isotopes. To correct for deviations in the ore standards, an independent means of evaluating the efficiencies of the individual separations and measurements is used.

17310 Fluorometric Uranium Analyzer. J. T. Byrne. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1408-1412.

Analyzer was constructed which, although simple in design, gives measurements that are virtually insensitive to line voltage variations of ± 15 volts and to threefold changes in lamp intensity.

17311 Spectrophotometric Determination of Ruthenium With 1,10-Phenanthroline. Charles V. Banks and Jerome W. O'Laughlin. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1412-1417.

A new spectrophotometric method for the determination of Ru is based on the reaction of Ru-(III) or Ru-(IV) with 1,10-phenanthroline in the presence of a reducing agent to form the very stable and intensely colored tris(1,10-phenanthroline)Ru-(II) ion.

17312 Coulometric Determination of Plutonium. William N. Carson, Jr., Jeanette W. Vanderwater, and Herman S. Gile. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1417-1422.

A general chemical method for the determination of small amounts of Pu in solution consists of a coulometric titration based on the preliminary oxidation of the Pu-(VI), followed by titration with electrolytically generated ferrous ion to Pu-(IV).

17313 Color Reaction Between Thorium and Quercetin and Separation Scheme for Interfering Ions. Oscar Menis, D. L. Manning, and Gerald Goldstein. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1426-1430.

17314 Infrared Spectrophotometry of Sulfate Ion. Combining Freeze-Drying With Potassium Bromide Disk Technique. Han Tai and A. L. Underwood. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1430-1433.

By combining freeze-drying with the potassium bromide disk technique, it is possible to apply infrared analysis to samples presented in the form of aqueous solutions. These techniques will permit direct photometric determinations of common polyatomic anions which are often difficult to determine at low concentrations by existing methods.

17315 Continuous and Semicontinuous Sampling Titrations. A. S. Said. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1435-1439.

Equations are derived for calculating the true volume of titrant needed for a titration where samples are withdrawn from the bulk of solution during the titration process.

17316 Evaluation of Quantitative Sugar Analysis by Paper Chromatography. Robert H. Quick. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1439-1441.

A laboratory method for the quantitative determination of six unknown sugars and a reference sugar on a single paper chromatogram.

17317 Quantitative Determination of Lactose and Monoses in Lactose Hydrolyzates. Rapid Horizontal Paper Chromatographic Method. Henry R. Roberts. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1443-1447.

17318 Rapid Procedure for Separating C_2 to C_6 Volatile Fatty Acids by Horizontal Paper Chromatography at Elevated Temperature. Henry R. Roberts and Wesley Bucek. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1447-1449.

17319 Separation and Quantitative Determination of Methyl Mannosides in an Automatically Controlled Cellulose Partition Column. Dwight F. Mowery, Jr. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1451-1453.

A reliable quantitative analytical method for nonreducing carbohydrates utilizes an automatically controlled cellulose powder column and the non-specific anthrone color reaction. The method was tested by analysis of mixtures of known composition containing methyl α-D-mannopyranoside, methyl β-D-mannopyranoside, methyl α-*D*-mannofuranoside, methyl β-D-mannofuranoside, and D-mannose.

17320 Anodic Polarographic Estimation of Aliphatic Sulfides in Petroleum. Harry V. Drushel and James F. Miller. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1456-1461.

Stationary Pt wire electrodes were used following a special a.c. treatment prior to polarization. A solvent-electrolyte containing nitrobenzene readily dissolves petroleum samples and has a relatively high electrical conductivity.

17321 Acidimetric Determination of Fluorine After Ion Exchange. Application to Aluminum Fluoride, Cryolite, and Fluorspar. Henri Shehyn. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1466-1470.

17322 Fluorometric Determination of Tin With Flavonol. Charles F. Coyle and Charles E. White. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1486-1488.

Flavonol produces a bright blue fluorescence with quadrivalent tin in 0.5 to 0.1N H_2SO_4 solution. The reagent is sensitive to about 0.1 γ of Sn(IV) per ml.

17323 Determination of Sulfoxides. R. R. Legault and Kermit Groves. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1495-1496.

A modified Barnard and Hargrave method for determination of sulfoxides that yield water-soluble sulfides upon reduction with $TiCl_3$.

17324 Determination of Sulfur in Titanium. Maurice Codell, George Norwitz, and Charles Clemency. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1496-1499.

Sulfur in Ti and Ti alloys can be determined by dissolving the sample in a mixture of HCl and HF. The evolved H_2S is absorbed in ammoniacal $CdCl_2$, which is then acidified and titrated with standard KI solution.

17325 Ion Exchange Micromethods for Separation of Fermentation Acids. Determination of Fumaric Acid in Fermentation Broth. Cecil H. Van Etten and Clara E. McGrew. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1506-1509.

17326 Gas Chromatographic Separation of Some Permanent Gases on Silica Gel at Reduced Temperatures. Dale H. Szulczewski and Takeru Higuchi. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1541-1543.

By use of 40- to 60-mesh silica gel as an adsorbent at the temperature of dry ice-acetone, mixtures of such gases as O, N, NO, and CO may be satisfactorily separated and analyzed.

17327 Analytical Distillation in Miniature Columns. Design and Testing of Teflon Spinning Band. A. G. Nerheim. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1546-1548.

To increase the efficiency of miniature spinning band columns, effects of band design were studied. A four-bladed Teflon band seems to offer the most advantages.

17328* A Microcolorimetric Method for the Determination of Shikimic Acid. Seiichi Yoshida and Masao Hasegawa. *Archives of Biochemistry and Biophysics*, v. 70, Aug. 1957, p. 377-381.

A spectrophotometric determination based on the reaction of the periodate oxidation product of shikimic acid with aniline to yield a Schiff's base.

17329* The Separation of Phosphate Esters and Other Metabolites by Ionophoresis and Chromatography on Paper. Victor C. Runeckles and Gleb Krotkov. *Archives of Biochemistry and Biophysics*, v. 70, Aug. 1957, p. 442-453.

17330* (Russian.) Quantitative Spectroscopic Analysis of a Gaseous Mixture of Hydrogen, Deuterium, and Tritium. **Spektral'nyi kolichestvennyi analiz izotopnogo sostava gazoobraznykh smesei vodoroda, deiteriia i tritiia.** M. N. Oganov and A. R. Striganov. *Atomnaia Energiia*, v. 3, no. 8, Aug. 1957, p. 112-120.

Describes experiment and equipment; comparison of experimental and theoretical data.

17331* (Russian.) The Phosphate-Hydroxyquinoline Separation Method and the Volumetric Determination of Zirconium. **Fosfatno-oksikhinolinovyi metod otdeleniia i ob'emnogo opredeleniia tsirkoniia.** A. V. Vinogradov and V. S. Shpinel'. *Atomnaia Energiia*, v. 3, no. 8, Aug. 1957, p. 130-134.

Separation of zirconium hydroxyquinoline from oxalate medium after dissolving the phosphate deposition in oxalic acid. Study of the conditions under which it is possible to separate Zr from Ti by phosphate precipitation, and of Nb and Ta by hydroxyquinoline precipitation.

17332* (Russian.) Spectral Analysis of Some Titanium Alloys and Welds of Their Alloys. **Spektral'nyi analiz nekotorykh titanovyk splavov i svarnykh shvov etikh splavov.** V. V. Bogdanova and E. S. Kudelia. *Avtomaticheskaia Svarka*, v. 10, no. 4, July-Aug. 1957, p. 29-32.

Determination of Al, Cr, Fe, Si and C in Ti alloys and their welds.

17333* (English.) **Reversed Phase Paper Chromatography and Detection of Steroids of the Cholesterol Class.** Robert P. Martin. *Biochimica et Biophysica Acta*, v. 25, Aug. 1957, p. 408-416.

This system in which the stationary phase is a high-boiling hydrocarbon mixture (odorless kerosene) and the mobile phase is 60% aq. propanol also may be conveniently used to free tissue extracts of so-called fat. Special application of two color reagents, phosphomolybdic acid and phosphotungstic acid is described.

17334 Separation of Tantalum From Titanium. Iu. A. Chernikhov, R. S. Tramm, and K. S. Pevzner. *Henry Brutcher Translation No.* 3990, 7 p. (From *Zavodskaia Laboratoriia*, v. 22, no. 6, 1956, p. 637-639.) Henry Brutcher, Altadena, Calif.

Description of an improved method for a really complete separation of Ta from large amounts (200-fold excess) of Ti in the presence of large quantities of Cb, prior to colorimetric determination of Ta by reaction with pyrogallol.

17335 Determination of Small Quantities of Tin in Ores. I. A. Blium and N. G. Zyrianova. *Henry Brutcher Translation No.* 4003, 3 p. (From *Zavodskaia Laboratoriia*, v. 22, no. 1, 1956, p. 46-47.) Henry Brutcher, Altadena, Calif.

Development of a method for tin in amounts of from 0.005 to 0.10% in any ore, based on separation from other elements by distillation as tetrabromide and subsequent polarographic determination.

17336 Isolation of Labelled Deoxyribonucleic Acid Phosphorus by a Modified Schmidt and Thannhauser Procedure. R. Daoust and Catherine E. Stevens Hooper. *Canadian Journal of Biochemistry and Physiology*, v. 35, Sept. 1957, p. 721-728.

17337* (English.) **Ultraviolet Spectrophotometric Determination of Iron(III) as Chloro-Complex.** Masayoshi Ishibashi, Tsunenobu Shigematsu, Yuuroku Yamamoto, Masayuki Tabushi, and Toyokichi Kitagawa. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 433-437.

Absorption spectra for solution of ferric perchlorate at various concentrations of HCl. Effects of temperature, acidity, and diverse ions.

17338* (English.) **Microcolorimetric Determination of Organic Sulfur by the Tin (II)-Strong Phosphoric Acid Reduction Method.** Toshiyasu Kiba, Ikuko Akaza, and Sachiko Taki. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 482-486.

17339 Behaviour of Some Alkylphosphonic Acids in Paper Chromatography and Paper Electrophoresis. Gennady M. Kosolapoff and Clarence H. Roy. *Chemical Society, Journal*, 1957, Aug., p. 3428-3430.

Variation of migration rate with size of alkyl group permits location but not separation of the acids.

17340 A Chromatographic Chamber for One-Dimensional Ascending and Descending Paper Chromatography. C. Kowala. *Chemistry & Industry*, 1957, no. 37, Sept. 14, p. 1234-1235.

17341 Photometric Stream Analyzers. I. Versatile Instruments for Measuring Composition. Leo G. Glasser. *Control Engineering*, v. 4, Oct. 1957, p. 87-95.

Fundamentals and applications of ultraviolet and infrared analyzers, colorimeters, and refractometers. A thorough discussion of the ultraviolet analyzer and the specific materials it can analyze.

17342* (English.) **Note on Polarographic Determination of Small Amounts of Lead.** O. A. Weber. *Croatica Chemica Acta*, v. 29, no. 2, 1957, p. 73-77.

Electrolyte used is a 0.5 *N* aqueous solution of succinic acid containing 0.008% gelatin. Electrode reaction consists in a reversible cathodic reduction of bivalent Pb ions to the uncharged metallic Pb.

17343 Analysis of Used Ion Exchange Resins. Elizabeth W. Baumann. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-218, June 1957, 24 p. (UF767 Un3.1dp Contin.)

A scheme for analyzing used, mixed ion exchange resin. Methods are suitable for slightly radioactive resins.

17344 Colorimetric Determination of Silicon in Iron and Steel. W. B. Sobers. *Foundry*, v. 85, Oct. 1957, p. 234 + 3 pages.

17345 Determination of Radiocesium by Complex Cobalticyanide Precipitation. James C. Langford. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49668, May 1957, 30 p. (UF767 Un3.1hw Contin.)

17346* Radiometric Titration of Rare Elements. Determination of Beryllium, Zirconium, and Thallium. I. P. Alimarin, I. M. Gibalo, and I. A. Sirotina. *International Journal of Applied Radiation and Isotopes*, v. 2, no. 2, 1957, p. 117-128.

New techniques for determining Be, Zr, and Tl. The composition of precipitates formed was studied.

17347 The Microdetermination of Dissolved Oxygen in Water. V. Development of a Self-Testing and Fully Compensating Analytical Method. E. C. Potter and J. F. White. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 459-467.

17348 Absorption and Solvent Extraction Procedures for the Separation of Carrier-Free Indium From Cadmium. Katheryn L. Lawson and Milton Kahn. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 87-92.

Indium is absorbed on glass, paper, or cellulose ester fibers from ammoniacal solution and is extracted from buffered acetate solutions by 8-hydroxyquinoline in chloroform.

17349 An Apparatus for Measurement of the Occlusion of Hydrogen by Metals. M. Kotyk, J. K. Magor, and H. M. Davis. *Metallurgia*, v. 56, Sept. 1957, p. 153-155.

A metallic specimen immersed in H of known pressure and volume at or near room temperature is heated at a succession of higher temperatures until equilibrium between gas and metal is established. Comparison with data obtained in similar experiments using a glass dummy specimen enables the amount of H occluded at any temperature to be determined.

17350* (Russian.) Simultaneous Micro-Determination of Carbon, Hydrogen, and Alkali Metal (Lithium, Sodium, Potassium). **Odnovremennoe mikroopredelenie ugleroda, vodoroda i shchelochnogo metalla (litiia, natriia, kaliia).** A. S. Zabrodina and V. P. Miroshina. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii*, v. 12, no. 2, 1957, p. 195-198.

Method involves combustion of the sample in a stream of O. Accuracy is ± 0.22%.

17351* Gas Chromatography and the Perfumer. W. A. Wiseman. *Perfumery and Essential Oil Record*, v. 48, Aug. 1957, p. 380-385.

Techniques and equipment used in assessing perfume quality.

17352 (German.) Development and Present State of Gas Determination in Metals, Especially as Regards Hydrogen in Aluminum. **Entwicklung und heutiger Stand der Bestimung von Gasen in Metallen, unter besonderer Berücksichtigung des Wasserstoffs in Aluminium.** F. Rohner. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, Aug. 1957, p. 243-248.

Formation of gases. Gas determination in solid and molten metals. Diagrams of an extracting apparatus for separate or joint extraction and measurements.

17353* (English.) **A New Spectrophotometric Determination of Titanium With Sodium Alizarinsulfonate.** Hidehiro Gotô, Yachiyo Kakita, and Michiko Namiki. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Aug. 1957, p. 245-252.

Alizarinsulfonate and $SnCl_2$ are reduced by Ti in HCl solution and turn green.

17354* (English.) **Photometric Determination of Tin in Iron and Steel. III. Photometric Determination of Tin With Sodium Diethyldithiocarbamate.** Hidehiro Gotô and Yachiyo Kakita. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Aug. 1957, p. 253-261.

17355 Application of Chromatography to Analysis of Pyrethrins. N. C. Brown, D. T. Hollinshead, R. F. Phipers, and Margaret C. Wood. *Soap and Chemical Specialties*, v. 33, Sept. 1957, p. 87 + 5 pages.

(To be continued.)

17356* (Russian.) Determination of Microquantities of Lead in Metallic Indium. **Opredelenie mikrokolichestv svintsa v metallicheskom indii.** A. I. Volkova and N. N. Zakharova. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 530-532.

Method is based on the coprecipitation of Pb and $BaCrO_4$.

17357 Current Procedures for the Analysis of UO_3, UF_4, and UF_6. C. J. Rodden. *U. S. Atomic Energy Commission*. TID-7003 (Del.), Feb. 1956, 134 p. (UF767 Un3ti Contin.)

Describes standard analytical procedures and AEC purity requirements. The purity of UO_3, UF_4, and UF_6 must approach at. wt. purity for use in the atomic energy field. Some contaminants, such as the high neutron absorbers B, Cd, and Gd, must be absent even to a higher degree than that required for at. wt. measurements.

17358* (German.) Ascorbic Determination of Copper (II)-Ions. **Ascorbinometrische Bestimmung von Kupfer(II)-ionen.** Ladislaus Erdey and Géza Siposs. *Zeitschrift für Analytische Chemie*, v. 157, no. 3, 1957, p. 166-177.

Among various processes tested, the ammonium chloride + sodium acetate method proved most practical in determining Cu ions by means of an ascorbic acid solution.

17359* (German.) Ferrometric Determination of Silver Ions. **Ferrometrische Bestimmung von Silberionen.** Ladislaus Erdey and Kathrin Vigh. *Zeitschrift für Analytische Chemie*, v. 157, no. 3, 1957, p. 184-192.

Determining Ag ions by means of "Variamin blue" as indicator, a process based on the quantitative reduction of Ag ions to Ag metal by means of an Fe(II) sulfate solution in the presence of alkali fluoride. Application to the determination of Ag in Ag-Cu alloys.

17360* (German.) Calculation of Errors in Analytical Chemistry. **Fehlerrechnung in der analytischen Chemie. II.** The Systematic Errors. **Die Systematischen Fehler.** Klaus Doerffel.

Zeitschrift für Analytische Chemie, v. 157, no. 4, 1957, p. 241-248.

Determination of systematic errors in a series of analyses. Absolute composition of each sample need not be known. Method can be applied to any wet analysis.

17361* (German.) Flame Photometric Alkali Analysis of Rocks. **Beitrag zur flammenphotometrischen Alkalianalyse von Gesteinen.** A. Willgallis. *Zeitschrift für Analytische Chemie*, v. 157, no. 4, 1957, p. 249-257.

Analysis of rocks containing 1.25 to 5.44% by weight of K_2O and 1.78 to 6.22% by weight of N_2O. Improved atomizing burner. Effects of metalloids. Sensitivity of the method.

17362* (German.) Quantitative Analytical Determination of Potassium by the Dead-Stop-Method. Sodium Tetraphenyloborate as Precipitating Reagent and Thallium (I)-Nitrate as Titrating Agent. **Massanalytische Bestimmung des Kaliums nach der Dead-stop-Methode. Natriumtetraphenylboborat als Fällungsreagens und Thallium (I)-nitrat als Titrationsreagens.** H. J. Schmidt. *Zeitschrift für Analyitische Chemie*, v. 157, no. 5, 1957, p. 321-338.

Determining K, ammonium, and the salts of organic bases. The precipitating agent was titrated with a $TlNO_3$ solution. The end product was speedily determined by means of a simple electronic system.

17363* (German.) A Simple Method for the Separation of Titanium, Niobium, and Tantalum From Hard Metals. **Einfache Methode zur Abtrennung von Titan, Niob und Tantal aus Hartmetallen.** E. Lassner and H. Weisser. *Zeitschrift für Analytische Chemie*, v. 157, no. 5, 1957, p. 343-345.

Ammonia precipitation was used. Small amounts of W, Fe, and Co were prevented from precipitating by adding ethylene diamine tetraacetate and glycerin. Accuracy is ± 1%.

See also: **17168** (detection of 5-pyrimidinyl disulfides); **17169** (analysis of serum proteins); **17172** (analysis of blood plasma); **17173** (analysis of human tissue); **17183** (estimation of cholesterol); **17213** (separation of biological compounds); **17570** (determination of nitrocellulose); **17571** (determination of cellulose); **17817** (determination of carbohydrates); **17837** (oxygen analyzer); **18088** (determination of Ag and Cu in Pb); **18472** (analysis of hydrocarbon polymers); **18517** (chromatography of volatile acids); **18583** (analysis of cellulose).

CHEMISTRY—INORGANIC AND GENERAL

17364 Abstracts of Papers. 132nd Meeting, American Chemical Society. Sections individually paged. 1957. American Chemical Society, New York. (QD1 Am35a Vis.)

Abstracts of papers prepared for the 132nd meeting of the American Chemical Society, Sept. 8 to 13, 1957.

17365 Tetrakistriphenylsiloxytitanium and Some Related Compounds. Vernon A. Zeitler and Charles A. Brown. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4616-4618.

Tetrakistriphenylsiloxytitanium was prepared in good yield by the reaction of triphenylsilanol with tetrabutoxytitanium and by the reaction of triphenylsilanol with titanium tetrachloride in the presence of ammonia. This compound shows an unusually high melting point 501-505 C and possesses considerable inertness toward acids and bases.

17366 Studies on the Chemistry of Halogens and of Polyhalides. XI. Molecular Complexes of Pyridine, 2-Picoline and 2,6-Lutidine With Iodine and Iodine Halides. Alexander I. Popov and Ralph H. Rygg. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4622-4625.

17367 The Preparation of Tungsten Carbide. Arthur E. Newkirk and Ifigenia Aliferis. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4629-4631.

Tungsten carbide may be prepared by heating tungstic acid, a blue oxide of tungsten, or ammonium paratungstate in a mixture of H and CH_4 at 850 to 1000 C.

17368 The Effect of Chloride Ion on the Exchange Reaction Between Thallium(I) and Thallium(II) in Sulfuric Acid Solutions. C. H. Brubaker, Jr., K. O. Groves, J. P. Mickel, and C. P. Knop. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4641-4643.

17369 Electron-Microscopical Investigations of Calcium Hydroxide and Calcium Carbonate. G. Schimmel. Paper from "Electron Microscopy. Proceedings of the Stockholm Conference, September 1956". Academic Press. 1957. p. 347-348. (QH211 EL25)

Calcium hydroxide precipitates from aqueous solution in the form of smooth, compact spherulites. On intensive irradiation the precipitate changed from an amorphous to a crystalline state, and $CaCO_3$ in a calcite structure was identified.

17370 Historical Perspectives in Twentieth Century Chemistry. Jack J. Bulloff. *Journal of Chemical Education*, v. 34, Sept. 1957, p. 452-454.

Twentieth century chemistry is yet to experience its greatest expansion. The electronic-nuclear period is well developed and gives chemistry today a powerful and useful system of chemical thought. The second industrial revolution greatly increases the productivity of research. New basic ideas of the first rank cannot occur within the now-completed framework of chemical physics. Such ideas are not being inspired in chemistry by the new directions in modern physics; they must come from advance in an area of science outside of quantum chemistry.

17371 The Hydrogen Fluoride Solvent System. I. A Qualitative Survey of Acids. A. F. Clifford, H. C. Beachell, and W. M. Jack. **II. Salts of the Fluoro Acids. Solvolysis.** A. F. Clifford and A. G. Morris. **III. The Preparation of Anhydrous Silver Fluoroborate.** A. F. Clifford and S. Kongpricha. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 57-58 + 1 plate.

17372* (English.) **Submicroscopic Topography of Oxidized Surface of Stibnite and Etched Surface of Zinc-blende.** Masaru Watanabe. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 874-882.

17373 Manganese Dioxide Prepared From Manganous Hydroxide. R. V. Lundquist. *U. S. Bureau of Mines, Report of Investigations* 5347, July 1957, 34 p. (TN21 Un3r)

Manganese dioxide obtained from the dithionate leaching product of Arizona ores, was not suitable for use in batteries.

17374* (Russian.) Equilibrium of $UI_4 \rightleftarrows UI_3 + I$ Reaction. **K voprosu o ravnovesii $UJ_4 \rightleftarrows UJ_3 + J$.** M. M. Popov and M. D. Senin. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1479-1481.

Results of reaction conducted at 1097 and 1776 K; a dissociation of UI_4 at 700-750 C produced UI_3.

17375* (Russian.) Study of the ClF_3-HF System. **Issledovanie sistemy ClF_3-HF.** N. S. Nikolaev and I. M. Maliukov. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1587-1590.

Polythermal analysis of the Cl-F_2-HF system showed an unlimited mutual solubility of ClF_3 and HF. Dissociation of ClF_3 in HF solution takes place in the following way: $ClF_3 \rightleftarrows ClF^{2+} + 2F^-$. This is a simple eutectic system with 44.0% ClF_3 and 56.0% HF, having m.p. −110.7 C.

17376* (Russian.) Study of the Hydrochloric Acid Solutions of Titanium Chlorides. **Issledovanie solianokislykh rastvorov chloridov titana.** I. S. Morozov and G. M. Toptygina. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1629-1638.

Reactions of $TiCl_4$ and $TiCl_3$ with HCl and H_2O were studied by the tensiometer method. Electric conductivity and isothermic solubility are examined.

17377* (Russian.) Studying the Complexes of Uranyl Nitrate With Diethyl Ether. **Issledovaniia kompleksov uranilnitrata s dietilovym efirom.** V. M. Vdovenko, M. P. Koval'skaia, and T. V. Kovaleva. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1677-1681.

Solubility of uranyl nitrate in the anhydrous diethyl ether and the composition of the solid phase which forms in equilibrium with the saturated solutions.

17378* (Russian.) The Effect of the Type of "Salting Out" Agents on the Distribution of Uranyl Nitrates in Small Quantities Between Aqueous Solutions and Diethyl Ether. **Vliianie prirody vysalivatelia na raspredelenie malykh kolichestv uranilnitrata mezhdu vodnymi rastvorami i dietilovym efirom.** V. M. Vdovenko and T. V. Kovaleva. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1682-1686.

Studies the salting out effect of Li, Na, K, NH_3, Mg, Ca, Sr, Ba, Zn, Cd, Al, and Fe nitrates on the distribution of uranyl nitrate.

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17379 Kinetics of the Amino-Acid-Catalyzed Dealdolization of Diacetone Alcohol. John C. Speck, Jr. and Arlington A. Forist. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4659-4660.

Velocity determinations were carried out for the dealdolization of diacetone alcohol in three amino-acid buffers. The data indicate that, other than hydroxide ion, the amino acid anion catalyzes this reaction by acting as an amine.

17380 Synthesis of Deoxyalloxazines (Benzopteridines). Thomas J. Bardos, Donald B. Olsen, and Takashi Enkoji. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4704-4708.

A new group of compounds, characterized as 2- and/or 4-substituted deoxyalloxazines or benzopteridines, as well as the known alloxazine derivative, lumichrome, was synthesized by the condensation of *dimeric* 4,5-dimethyl-*o*-benzoquinone with various 5.6-diaminopyrimidines. Several of the new compounds are of biological interest as antimetabolites.

17381 Various Reactions of Organic Bases With 1,1,1-Trinitroethane and 1-Halo-1,1-Dinitroethanes. 1,1-Dinitroethene as a Reaction Intermediate. Lawrence Zeldin and Harold Shechter. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4708-4716.

17382 Thiazolidine Chemistry. III. The Preparation and Reduction of Some 2-Phenyl-3-*n*-Alkyl-4-Thiazolidinones. Irving R. Schmolka and Paul E. Spoerri. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4716-4720.

17383 Photochemical Reactions. VII. The Intramolecular Cyclization of Carvone to Carvonecamphor. G. Büchi and I. M. Goldman. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4741-4748.

17384 A Study of Organosilicon Free Radicals. Jay Curtice, Henry Gilman, and George S. Hammond. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4754-4759.

Organosilicon free radicals were studied as reactive intermediates in radical induced reactions of triphenylsilane, and as chain transfer agents in the thermal polymerization of styrene.

17385* The Preparation of Aromatic Aldehydes. VI. Benzaldehydes From Acids and Acid Derivatives. Kurt Kulka. *American Perfumer and Aromatics*, v. 70, Sept. 1957, p. 47-50.

Reduction with Na amalgam; pyrolysis of Ca salts; decarboxylation of benzoylformic acids; condensation of sodium glyoxylate with a monalkyl ether of pyrocatechol; the Rosenmund reaction; the Sonn and Müller synthesis.

17386* (German.) Organic Complex Compounds of Molybdenum. **Organische Komplexverbindungen des Molybdäns.** G. Spengler and J. Gänsheimer. *Angewandte Chemie*, v. 69, Aug. 21, 1957, p. 523-529.

Soluble molybdates like Na_2MoO_4 and Mo halides form complexes with organic constituents, especially with organic O, N, and S compounds.

17387* (German.) Metallorganic Compounds. **Matallorganische Verbindungen. XXIV.** Organo-Aluminum-Fluoride. **Organo-Aluminium-Fluoride.** Karl Ziegler and Roland Köster. *Annalen der Chemie*, v. 608, nos. 1-3, 1957, p. 1-7.

Description of dialkylaluminum fluoride, R_2AlF, and its complex combinations with alkali fluorides. A complex sodium fluoride compound $Na(AlR_2F_2)$ decomposes under the influence of heat into cryolite and trialkylaluminum. Alkylaluminum difluoride is difficult to prepare and its properties resemble those of aluminum fluoride.

17388* (French.) Investigation of the Autoxidation of Indenofluorene Orthoquinoid Hydrocarbides. **Hydrocarbues indénofluoréeniques orthoquinoïdes. Recherches en rapport avec leur autoxydation.** André Le Berre. *Annales de Chimie (Paris)*, v. 2, May-June 1957, p. 371-425.

A study of indenofluorenes and benzoindeno fluorenes and of their peroxides during the autoxidation of the diene compounds.

17389* (English.) **Thiophene Chemistry. II. A New Method of Preparing 2,4-Dibromothiophene and Its Grignard and Lithium Reagents. Two-Stage Mechanism in the Metalation of 2,4-Dibromothiophene With Butyllithium. III. On the Preparation of 3,4-Dibromothiophene and Its Grignard and Lithium Reagents. Two-Stage Metalation of 3,4-Dibromothiophene. Substitution Reactions of 4-Bromo-3-Thiophenecarboxylic Acid. IV. The Preparation of Bromosubstituted Thiophene Grignard Reagents by "Entrainment" and Transmetalation. An Indication of the Validity of the Anion Exchange Mechanism. V. Dehalogenation of Bromosubstituted Thiophenecarboxylic Acids With Butyllithium. An Indication of a Nucleophilic Mechanism in the Bromine-Lithium Interconversion. VI. Bromination of Thiophene and Bromothiophenes.** Sven-Olov Lawesson. *Arkiv för Kemi*, v. 11, no. 4, 1957, p. 317-348; 373-386.

17390* (English.) **Synthesis of dl-Sarkomycin (2-Methylenecyclopentanone - 3 - Carboxylic Acid).** Katsuyuki Toki. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 450-454.

Synthesis was accomplished in a four-stage process starting from ethyl cyclopentanone-3-carboxylate, prepared by Kay's procedure.

17391 Derivatives of 1:2:3:3a:8:8a-Hexahydrocyclopent[a]Indene. Alan Marchant. *Chemical Society, Journal*, Aug. 1957, p. 3325-3328.

Two methods of synthesis.

17392 The Synthesis and Properties of Substituted 1:2:3:4-Tetrahydro-4-Oxoarsinolines and of 1 : 6-Dioxoarsulolidines. Frederick G. Mann and A. J. Wilkinson. *Chemical Society, Journal*, Aug. 1957, p. 3336-3346.

17393 The Structure and Properties of Certain Polycyclic Indolo- and Quinolino-Derivatives. VIII. Derivatives of 1:2:3:4-Tetrahydro-4-Oxoarsinoline and of 1:6-Dioxoarsulolidine. Frederick G. Mann and A. J. Wilkinson. **IX. Derivatives of 1:3:4:5-Tetrahydro - 5 - Oxobenz[cd]Indole.** Frederick G. Mann and A. J. Tetlow. *Chemical Society, Journal*, Aug. 1957, p. 3346-3366.

17394 Olefin⁺ Co-Ordination Compounds. V. Some Diene Complexes of Palladium(II) and Their Alkoxy-Derivatives. J. Chatt, L. M. Vallarino, and L. M. Venanzi. *Chemical Society, Journal*, Aug. 1957, p. 3413-3416.

Preparation and properties of compounds of the types [diene PdX_2], [(diene·OR)$_2Pd_2X_2$], and [(diene·OR), *p*-toluidine PdCl].

17395 The Chemistry of Santonin. IV. Some Irradiation Products of the Santonins. Wesley Cocker, K. Crowley, J. T. Edward, T. B. H. McMurry, and E. R. Stuart. *Chemical Society, Journal*, Aug. 1957, p. 3416-3428.

The chemistry of the compounds obtained by the irradiation of aqueous solutions of potassium santoninate and potassium 11β (H)-santoninate with ultraviolet light.

17396 Derivatives of Benzo-1:4-Dioxan. IV. P. M. Heertjes, B. J. Knape, H. C. A. van Beek, and K. van den Boogaart. *Chemical Society, Journal*, Aug. 1957, p. 3445-3447.

Preparation and orientation of some derivatives of 6-hydroxybenzene-1:4-dioxan and benzo-1:4-dioxan-6-carboxylic acid.

17397 The Preparation of a Pyrrolo(3′:2′-3:4)Quinolone From (2-Ethoxyethyl)Malondianilide. M. F. Grundon and N. J. McCorkindale. *Chemical Society, Journal*, Aug. 1957, p. 3448-3450.

17398 Some Novel Hydroporphyrins. Ulli Eisner. *Chemical Society, Journal*, Aug. 1957, p. 3461-3469.

The two isomeric octaethyltetrahydroporphins were prepared by reduction of octaethylporphin with Na and *iso*pentyl alcohol. Reduction of the corresponding chlorin afforded, in addition to the tetrahydro-derivatives, the octaethylhexa- and an octaethylocta-hydroporphin.

17399 The Isomerisation of the Lactone of 2'-(1-Hydroxy-1-Methylethyl)-Diphenyl-2-Carboxylic Acid. Pauline M. Everitt and E. E. Turner. *Chemical Society, Journal*, Aug. 1957, p. 3477-3479.

When the lactone is heated with anhydrous formic acid or with 50% H_2SO_4, 9:9-dimethylfluorene-4-carboxylic acid is produced. When it is heated with alumina, 2'-(1-methylvinyl)diphenyl-2-carboxylic acid is obtained.

17400 *cyclo*Hexane-1:3-Diones. II. A New Synthesis of Substituted *p*-Terphenyls. G. R. Ames and W. Davey. *Chemical Society, Journal*, Aug. 1957, p. 3480-3487.

17401 Indoles. II. The Structure of Indole Dimer. III. The Structure of Zatti and Ferratini's "Dinitrosoindole". H. F. Hodson and G. F. Smith. *Chemical Society, Journal*, Aug. 1957, p. 3544-3548.

17402 The Disulphones Derived by Oxidation of 2-Amino-2-Deoxy-D-Glucose Diethyl Dithioacetal Hydrochloride and Its *N*-Acetyl Derivative With Peroxypropionic Acid. L. Hough and Mahmoud I. Taha. *Chemical Society Journal*, Aug. 1957, p. 3564-3572.

17403 Glyceride Synthesis by Direct Esterification. L. Hartman. *Chemical Society, Journal*, Aug. 1957, p. 3572-3575.

Glycerides of known structure were synthesized without recourse to protecting groups, by making use of differences in reactivity of primary and secondary hydroxl groups of glycerol.

17404 The Reactions of Phosphorothiolates With Halogens. C. J. M. Stirling. *Chemical Society, Journal*, Aug. 1957, p. 3597-3604.

Chlorine and Br react with triethyl and S-benzyl diethyl phosphorothiolate in anhydrous conditions to give the sulphenyl halides and phosphorohalidates. In water, alkanesulphonyl halides and alkyl halides are formed together with diethyl hydrogen phosphate.

17405 Triazaphenanthrenes. I. Derivatives of 10-Phenyl-1:3:9-Triazaphenanthrene. II. Derivatives of 10- Phenyl-1:2:9-Triazaphenanthrene. C. M. Atkinson and A. R. Mattocks. *Chemical Society, Journal*, Aug. 1957, p. 3718-3726.

Preparation and properties.

17406 Hydrogenolysis of Aromatic Carbonyl Compounds and Alcohols With Aluminium Chloride and Lithium Aluminium Hydride. B. R. Brown and A. M. S. White. *Chemical Society, Journal*, Aug. 1957, p. 3755-3757.

Aromatic ketones are smoothly hydrogenolysed by $AlCl_3$ and $LiAlH_4$ in ether. Benzaldehyde yields benzyl alcohol, but *p*-methoxy- and *p*-dimethylamino-benzaldehyde give the corresponding toluenes.

17407 The Isomeric Pyruvamide Phenylhydrazones. R. A. Abramovitch and Ian D. Spenser. *Chemical Society, Journal*, Aug. 1957, p. 3767-3770.

syn- and *anti*-Structures are assigned to the pairs of pyruvamide phenylhydrazones are methyl pyruvate phenylhydazones on the basis of infrared spectra, hydrogen-bonding occurring in the *syn*-forms.

17408* (German.) Continuous Preparation of Tetraethoxysilane. **Kontinuierliche Darstellung von Tetraäthoxysilan.** Adalbert Ráskai and Nikolaus Nádasy. *Chemische Technik*, v. 9, Aug. 1957, p. 463-466.

Description of a new method of continuous production which yields 82% of tetraethoxysilane. Loss of silicon-tetrachloride is only 4.7%.

17409* (English.) **On Terpenes. LXXII. Preparation of Pure Compounds of the α- and β-Santalene Series.** V. Herout, V. Jarolím, and J. Plíva. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 773-778.

The α- and β-santalene, epimers α- and β- santalol, and their hydrogenation products were prepared and infra-red spectra recorded.

17410* (English.) **Preparation of β-Amino*iso*butyric Acid From Glycine Via the Wolff Rearrangement of Diazoethylketones.** K. Balenović, I. Jambrešić, and I. Ranogajec. *Croatica Chemica Acta*, v. 29, no. 2, 1957, p. 87-92.

17411* Introduction of the *N*-Phthaloyl Group Into Heat-Sensitive Amino Acid Derivatives; *N*-Phthaloyl-*L*-Aspartic Acid. K. Balenović, B. Gašpert, and N. Štimac. *Croatica Chemica Acta*, v. 29, no. 2, 1957, p. 93-95.

17412* (Russian.) A Catalytic Synthesis of Para-Nitro-, Amino-, and Sulphamido-Derivatives of 2-Phenylquinoline and 2-Phenyl-5,6-Benzoquinoline. **Kataliticheskii sintez para-, nitro-, amino-i sul'famidoproizvodnykh 2-fenilkhinolina i 2-fenil-5,6-benzokhinolina.** N. S. Kozlov and O. K. Koz'minykh. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 785-788.

17413* (Russian.) The Synthesis of Alkylferrocenes by Friedel-Krafts Reaction. **Sintez alkilferrotsenov reaktsiei Fridelia-Kraftsa.** A. N. Nesmeianov and N. S. Kochetkova. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 800-802.

Alkylation of ferrocene with alkyl halide in the presence of aluminum chloride.

17414* (Russian.) Thermal Decomposition of Nitrocellulose in Vacuum. **O termicheskom raspade nitrokletchatki v vakuume.** K. K. Andreev and B. S. Samsonov. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 815-818.

17415* (Russian.) New Transformations of Pyridine Salts and Snythesis of γ-Amine Substituted Pyridines. **Novye prevrashcheniia piridinievykh solei i sintez γ-Aminozameshchennykh piridinov.** A. F. Vompe, N. V. Monich, N. F. Turitsyna, and L. V. Ivanova. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1235-1238.

Synthesis and transformations of γ-cyclohexylaminopyridine (m.p. 147-148 C) and γ-dimethylaminopyridine (m.p. 112-113 C).

17416 (German.) Synthesis of Sphingosine and Its Stereoisomers. **De Synthese des Sphingosins und seiner Stereoisomeren.** C. A. Grob and F. Gadient. *Helvetica Chimica Acta*, v. 40, no. 5, 1957, p. 1145-1157.

17417 (German.) Synthesis of Pyrido-[1,2-c]-Pyrimidinone. **Synthese von Pyrido-[1,2-c]-pyrimidonen.** A. Hunger and K. Hoffmann. *Helvetica Chimica Acta*, v. 40, no. 5, 1957, p. 1319-1330.

The synthesis of 1 H-4-phenyl-pyrido-[1,2-c]-pyrimido-1,3(2H)-dione by condensation of phenyl-pyridyl-(2)-acetamide with diethyl carbonate and sodium ethoxide, as well as the preparation of some of its derivatives.

17418 Ion Exchangers in Organic and Biochemistry. Calvin Calmon and T. R. E. Kressman, editors. 761 p. 1957. Interscience Publishers, New York. (QD561 C13i)

Fundamentals of ion exchange and the techniques and apparatus used in carrying out the exchange and separation of ions. Application to specific aspects of organic and biochemistry.

17419* (Russian.) Tracer Method for Studying Methane Oxidation Reactions. **Issledovanie reaktsii okisleniia metana pri pomoshchi mechenykh atomov. II.** Mechanism of Carbon Dioxide Formation. **O mekhanizme obrazovaniia dvuokisi ugleroda.** R. I. Moshkina, A. B. Nalbandian, M. B. Neiman, and G. I. Feklisov. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 7, July, p. 801-805.

Carbon monoxide is not the only forerunner of CO_2 formation during the methane oxidation; only about 25% of the CO_2 is formed from oxidized CO. Reduction of $C^{14}O_2$ with metallic Zn yields 98% $C^{14}O$.

17420* (Russian.) Organoboron Compounds. **Bororganicheskie soedineniia. XVII.** Interaction of Amine Complexes of Alkyl Diarylborinates and Synthesis of Unsymmetrical Borontriaryl Organolithium Compounds. **O vzaimodeistvii aminnykh kompleksov efirov diarilbornykh kislot i litiiaromaticheskikh soedinenii. Sintez nesimmetrchnykh bortriarilov.** B. M. Mikhailov and V. A. Vaver. *Izvestiia Akademii N-uk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 7, July, p. 812-817.

17421* (Russian.) Redox Systems for Initiating Radical Processes. **Okislitel'no-vosstanovitel'nye sistemy dlia initsiirovaniia radikal'nykh protsessov. V.** Redox Systems for Rubber Structural Compositions in Hydrocarbon Solutions. **Okislitel'no-vosstanovitel'nye sistemy dlia strukturirovaniia kauchukov v uglevodorodnykh rastvorakh.** E. I. Tiniakova, B. A. Dolgoplosk, and V. N. Reikh. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 7, July, p. 851-857.

17422* (English.) **Furoquinolines. XII. Synthesis of Some 2,3-Dihydro-4-Methoxyfuro[2,3-b]Quinolines.** Tatsuo Ohta and Yo Mori. *Japan Academy, Proceedings*, v. 33, June 1957, p. 346-350.

Syntheses of ten compounds are described.

17423 Dinuclear Novolaks From *m*- and *p*-Cresol. L. E. A. Godfrey, E. G. E. Hawkins, and P. A. Jenkins. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 440-446.

The six two-ring novolaks theoretically obtainable from *m*-cresol and formaldehyde were synthesized and the three dinuclear novolaks involving one molecule each of *m*-cresol and *p*-cresol were prepared.

17424 Behavior of Triphenylsilane, Triphenylgermane, and Triphenyltin Hydride in the Presence of Olefins. Richard Fuchs and Henry Gilman. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1009-1011.

Compounds are combined with cyclohexane or, in one case, 1,1-diphenylethylene.

17425 Stability of an Ether Solution of Methylmagnesium Iodide. Henry Gilman and Donald L. Esmay. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1011-1013.

Above was found essentially unchanged after twenty years.

17426 Derivatives of Ferrocene. II. The Preparation of Some Acylferrocenes and Alkylferrocenes. Martin Vogel, Marvin Rausch, and Harold Rosenberg. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1016-1018.

17427 Reduction of Nitroparaffins by Alkylation. I. Alkylation With Trialkyl Oxonium Salts. E. Guy Donaruma. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1024-1029.

Describes reactions of cyclohexanone oxime-*O*-alkyl ethers.

17428 Snythesis of Iminotetrazoline Derivatives as Trichomonacidal and Fungicidal Agents. Robert M. Herbst and Charles F. Froberger. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1050-1053.

17429 Competitive Metalation of Diphenyl Sulfone and 4,4'-Dimethyldiphenyl Sulfone by *n*-Butyllithium. David A. Shirley, Erwin A. Lehto, C. Wayne Holley, and Hilton A. Smith. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1073-1076.

Reaction resulted in 47% metalation of diphenyl sulfone and 53% metalation of the dimethyldiphenyl sulfone.

17430 Kinetics of Diels-Alder Reactions of Eleostearic Acids With Maleic Anhydride and Substituted Maleic Anhydrides. W. G. Bickford, Joan S. Hoffmann, Dorothy C. Heinzelman, and Sara P. Fore. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1080-1083.

Reactions of α- and β-eleostearic acids with chloromaleic, methylmaleic, and maleic anhydrides were investigated.

17431 Synthesis of Ring-Substituted *N*-Phenylglycines, Their Nitriles and Amides. Akira Takeda. *Journal of Organic Chemistry*, v. 22, Sept. 1957, p. 1096-1100.

Biological testing showed many of these compounds to be active as plant growth substances.

17432* (Russian.) Production of Alkylarylsulfonate (Sulfonal NP) on the Basis of Propylene Polymers. **Proizvodstvo alkilarilsul'fonatov (sul'fonola-NP) na osnove polimerov propilena.** I. F. Blagovidov, L. A. Potolovskii, and A. I. Doladugin. *Khimiia i Tekhnologiia Topliva, i Masel*, 1957, no. 8, Aug., p. 4-13.

Description and comparison of methods of preparation of arylalkylsulfonates with and without chlorine.

17433 Organic Synthesis. An Annual Publication of Satisfactory Methods for the Preparation of Organic Chemicals. James Cason, editor. v. XXXVII. 109 p. 1957. John Wiley & Sons, New York. (QD262 Or3s)

Procedures for preparing 29 organic compounds.

17434 Physical Properties of Chemical Compounds. 536 p. 1955. American Chemical Society, Washington, D. C. (QD291 D81p)

A systematic tabular presentation of accurate data on the physical properties of 511 organic cyclic compounds.

17435* (Polish.) The Problems of the Synthesis of Herbicides. **Z zagadnień otrzymywania środków chwastobójczych. V.** Study of the Rate of Condensation of Sodium Phenate and Chloroacetate With Sodium Chlorooctane in Aqueous Medium. **Badania nad szybkością kondensacji fenolanów i chlorofenolanów sedowych z chlorooctanen sodowym w środowisku wodnym.** Z. Eckstein, W. Ciepieńko, E. Grochowski, W. Sobótka, and B. Zaszczyńska. *Przemysł Chemiczny*, v. 13, no. 7, July 1957, p. 390-393.

Condensation of sodium chloroacetate with sodium phenate, sodium-2-methylphenate and with 2,4-dichloro-, 2,5-dichloro-, 2,4,5-trichloro-, and 2-methyl-4-chlorophenate in aqueous medium.

17436* Radiolysis of Aqueous Solutions of Hydrocarbons —Benzene, Benzene-d_6, Cyclohexane. P. V. Phung and Milton Burton. *Radiation Research*, v. 7, Sept. 1957, p. 199-216.

Reaction of benzene with irradiated water at various pH's; behavior of H atoms in the presence of hydrocarbons in the liquid phase. Experiments on solutions of benzene in D_2O and of benzene-d_6 in H_2O give information on primary yields in γ-ray-induced decomposition of both heavy and ordinary water.

17437* Intramolecular Hydrogen Bonding in Organic Chemistry. G. M. Badger. *Reviews of Pure and Applied Chemistry*, v. 7, June 1957, p. 55-68.

Methods of detecting such bonds; steric considerations; some chemical consequences.

17438* (Polish.) Crystalline Sodium Xanthates. **Krystaliczne ksantogeniany sodowe.** Mirosław Oktawiec. *Rudy i Metale Niezelazne*, v. 2, no. 2, June 1957, p. 46-49.

The filtering and drying processes, causing a great loss of xanthate, were completely eliminated. Tables show the improvement in raw material use. Sulfite alcohol was used for the production of ethyl-sodium xanthate.

17439 Evaluation of Sequestrants in Bottle Washing. R. B. Colaric, A. T. Ballum, P. Snikeris, and J. V. Karabinos. *Soap and Chemical Specialties*, v. 33, Sept. 1957, p. 47-49.

Method is based on the amount of scale deposited on stainless-steel screen of large surface area when concentrated caustic solutions containing various additives are admixed with hard tap water at 130 F.

17440 Alcohol-Ethylene Oxide and Related Nonionic Surfactants. Richard D. Fine. *Soap and Chemical Specialties*, v. 33, Sept. 1957, p. 50 + 5 pages.

An important class of nonionic surfactants is produced by reacting alcohols with ethylene oxide to form ethers, which are valuable as alkali stable detergents, wetting agents, dyeing assistants, and emulsifiers.

17441* (French.) Pyridazines. **Pyridazines. II.** Preparing Pyridazines From Furan Derivatives. **La préparation des pyridazines à partir de dérivés du furanne. III.** Pyridazines Starting From Maleic Anhydrides and Ketonic Acids. Ultraviolet Spectra of Pyridazines. **Pyridazines à partir d'anhydrides maléiques et d'acides cétoniques. Spectres Ultraviolets des pyridazines. IV.** A New Synthesis of Pyridazines; pK of Pyridazines. **Une nouvelle synthèse des pyridazines; pK des pyridazines.** Jacques Levisalles. *Société Chimique de France, Bulletin*, 1957, nos. 8-9, Aug.-Sept., p. 997-1014.

17442* (French.) The Methylation of Cyclopentanones. **Sur la méthylation des cyclopentanones.** François G. Gault, Jean E. Germain, and Jean-Marie Conia. *Société Chimique de France, Bulletin*, 1957, no. 8-9, Aug.-Sept., p. 1064-1069.

The sodium t-amylate method was used to study the monomethylation and polymethylation of cyclopentanones in connection with the preparation of pure cyclopentane derivatives. Isomer and homologous ketone mixtures were studied.

17443* **The Structure of Dendrolasin.** A. Quilico, F. Piozzi, and M. Pavan. *Tetrahedron*, v. 1, no. 3, 1957, p. 177-185.

Catalytic hydrogenation affords, depending on the conditions, a tetrahydroderivative which is still a furan, and an octahydroderivative which is a tetrahydrofuran. Permanganate oxidation of dendrolasin yields acetone and succinic acid; on ozonolysis, besides these two products, levulinic aldehyde is also formed.

17444* **Synthesis of Tetrahydro- and Perhydro-Dendrolasin.** A. Quilico, P. Grünanger, and F. Piozzi. *Tetrahedron*, v. 1, no. 3, 1957, p. 186-194.

Tetrahydrodendrolasin [β-(4:8-dimethylnonyl) furan] was prepared by condensation of β-furoyl chloride with tetrahydrogeranylcadmium and subsequent Wolff-Kishner reduction of the resulting ketone. Perhydrodendrolasin [β-(4:3-dimethylnonyl) tetrahydrofuran] was synthesized by Stobbe condensation of 4:8-dimethylnonoic aldehyde with ethyl succinate, followed by reduction to 2-(4′:8′-dimethylnonyl) butandiol-1:4 and dehydration of this last to the corresponding tetrahydrofuran derivative.

17445* **Chemical Effects of Steric Strains. XIII. Kinetics of the Reaction of Sodium Borohydride With Carbonyl Groups—A Convenient Tool for Investigating the Reactivities of Aldehydes and Ketones.** H. C. Brown, O. H. Wheeler, and K. Ichikawa. **XIV. The Effect of Ring Size on the Rate of Reaction of the Cyclanones With Sodium Borohydride.** Herbert C. Brown and K. Ichikawa. *Tetrahedron*, v. 1, no. 3, 1957, p. 214-230.

17446* **High Purity Preparation of the Benzene Carboxylic Acids Giving Solid, Neutral Methyl Esters.** Felipe González-Sánchez. *Tetrahedron*, v. 1, no. 3, 1957, p. 231-237.

The purities of the acids which have no definite melting-points were checked by reference to the material balances of the hydrolyses of the esters in conjunction with the elementary analyses of the acids. Corrected melting-points are given for the esters. Data in the literature are examined in the light of the present results.

17447* **Thermal Telomerisation of Silanes With Olefins.** A. N. Nesmeyanov, R. Kh. Freidlina, and E. C. Chukovskaya. *Tetrahedron*, v. 1, no. 3, 1957, p. 248-252.

Thermal telomerization reaction of methyldichlorosilane with ethylene at 260-275 C and pressure of 560 atm. has been effected. Reaction of trichlorosilane with ethylene has been effected at 270-285 C and 200 atm. pressure. Preliminary data obtained show methyldichlorosilane and propylene also to undergo the telomerization reaction at 260-275 C and pressures of 100-120 atm.

17448* **Oxidation Cyclisation of Diphenyl-2 Carboxylic Acid.** G. W. Kenner, M. A. Murray, and C. M. B. Tylor. *Tetrahedron*, v. 1, no. 3, 1957, p. 259-268.

The dehydrogenation of diphenyl-2 carboxylic acid to the lactone was accomplished by oxidation with chromic acid or H_2O_2 and its derivatives, by decomposition of the diacyl peroxide derived from this acid and by electrolysis of its sodium salts.

17449* (Russian.) Effect of Space Factors on Properties of Dyes Containing a Biphenyl Ring. **Vliianie prostranstvennykh faktorov na svoistva krasitelei, soderzhashchikh iadro bifenila. VIII.** Bisazodyes From Meta- and Para- Aminobenzol Derivatives of Benzidine and 2,2′-Dimethylbenzidine. **Bisazokrasiteli iz meta- i para-aminobenzol'nykh proizvodnykh benzidina i 2,2′-dimetilbenzidina.** B. M. Krasovitskii, B. I. Ostrovskaia, and V. B. Smeliakova. **IX.** Effect of Spatial Structure on the Color of Monoazodyes, Derivatives of Biphenyl, Fluorene and Binaphthyl. **Vliianie prostranstvennogo stroeniia na okrasku monoazokrasitelei-proizvodnykh bifenila, fluorena i binaftila.** V. M. Krasovitskii, L. M. Litvinenko, and T. A. Serova. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 496-504.

17450* (Russian.) Reaction of α-Oxides With Ammonias, Amines, and Other Nitrous Compounds. **Reaktsiia α-okisei s ammiakom, aminami i drugimi azotistymi soedineniiami.** M. S. Malinovskii. *Uspekhi Khimii*, v. 26, no. 7, July 1957, p. 801-823.

Different methods for producing ethanolamies. Industrial applications. Interaction of olefin oxides with ammonias and some amines on oxide catalysts. Interaction of α-oxide compounds with prussic and thiocyanate acids.

17451* (Russian.) Catalytic Reaction of Ethers With Carboxylic Acids. **Kataliticheskoe vzaimodeistvie prostykh efirov s karbonovymi kislotami.** R. M. Flid, A. N. Protasova, and E. A. Trakhtenberg. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1460-1465.

Preparing the esters by the reaction of carboxylic acids (acetic, propionic, and butyrate) with ethers: $2RCOOH + R_1)_2O = 2RCOOR, + H_2O$. The best catalyst for the reaction was a phosphorous acid deposited on activated carbon of AR-3 type. Necessary conditions for the reactions.

17452* (Russian.) Cycloalkylation of Aromatic Compounds. **Tsikloalkilirovanie aromaticheskikh soedinenii. XI.** Condensation Product of Cycloheptanol With Benzene. **O produkte kondensatsii tsiklogeptanola s benzolom.** N. G. Sidorova and I. P. Tsukervanik. **XII.** Synthesis and Transformation of 1-Methyl-2-Phenyl- and 1-Methyl-3-Phenylcyclohexanes. **Sintez i nekotorye prevrashcheniia 1-metil-2-fenil-i 1-metil-3-feniltsiklogeksanov.** N. G. Sidorova. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1469-1475.

Preparation of cycloheptabenzene by the condensation method of cycloheptanol with benzene in the presence of aluminum chloride. Snythesis of 1-methyl-2-phenyl-and 1-methyl-3-phenyl cyclohexanes which were obtained in the form of cis- and trans-mixtures. Hydration of these compounds and the products of this process. Dehydration conditions of 1-methyl-2-phenyl cyclohexane and products obtained.

17453* (Russian.) Organosilicon Derivatives of Boric Acid: Tris(Trialkylsilyl)Borates and Polybororganosiloxanes. **Kremneorganicheskie proizvodnye bornoi kisloty-tris(trialkilsilil) boraty i poliboroorganosiloksany.** M. G. Voronkov and V. N. Zgonnik. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1476-1483.

Synthesis of tris(trialkyl-silyl) borates and polybororganosiloxanes. Description of four tris(trialkylsilyl) borates obtained by different methods.

17454* (Russian.) Synthesis of Tris(Trialkyl Silyl)Phosphates by New Methods. **Nvye metody sinteza tris(trialkilsilil)fosfatov.** M. G. Voronkov and V. N. Zgonnik. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1483-1486.

Synthesis of tris(trialkylsilyl) phosphates by reaction of orthophosphorous acid with trialkylkoxysilanes or trialkylchlorsilanes and by reaction of trialkylphosphates with trialkylhalogensilanes. By analogous methods a different phosphorosilicorganic polymers could be synthesized.

17455* (Russian.) Synthesis of Diethylaminomethyl Ethers of Dimethylethinyl Carbinol, Dimethylvinylethinylcarbinol, and Tetramethylbutyndiol. **Sintez dietilaminometilovykh efirov dimetiletinilkarbinola, dimetilviniletinilkarbinola i tetrametilbutindiola.** E. S. Lagucheva. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1518-1524.

Synthesis of diethylaminomethyl ethers by the amino-methylation of tertiary acetylene alcohols.

17456* (Russian.) Study of Alkoxysilanes. **Issledovaniia v oblasti alkoksisilanov. VIII.** Alkyl(Aryl)Acetoxysilanes and Their Reaction With Aliphatic Alcohols. **Alkil(aril)atsetoksisilany i ikh vzaimodeistvie s alifaticheskimi spirtami.** B. N. Dolgov, V. P. Davydova, and M. G. Voronkov. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1593-1599.

See also: **17211** (chemistry of fats and lipids); **17786** (petrochemical statistics); **17826** (chemistry of humic acid); **18469** (decomposition of benzoyl peroxide).

CHEMISTRY—PHYSICAL

17457* (German.) Afterglow of TlCl-Activated-NaCl Recrystallization Phosphors. **Über das Nachleuchten von mit TlCl Aktivierten NaCl-Rekristallisationsphosphoren.** Z. Morlin. *Acta Physica Academiae Scientiarum Hungaricae*, v. 7, no. 3, 1957, p. 341-356.

Preparation of TlCl-activated NaCl tablets. Thallium can be incorporated into the NaCl crystal lattice by recrystallization. The fading out of the recrystallization phosphors can be expressed by a hyperbolical law. The total light depends upon Tl concentration.

17458 Advances in Catalysis and Related Subjects. v. IX. Proceedings of the International Congress on Catalysis. Philadelphia, Pennsylvania, 1956. Adalbert Farkas, editor. 847 p. 1957. Academic Press, New York. (QD501 A95c Vis.)

These 83 papers deal with hydrogenation and hydrogen exchange reactions, physical properties of catalysts, electronic properties and catalytic activity, homogeneous catalysis and related effects, surface chemistry and its relation to catalysis, techniques and technology of catalysis, and other related special topics.

17459 Determination of Successive Formation Constants by Spectrophotometry. Leonard Newman and David N. Hume. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4571-4576.

General equations were derived by means of which successive formation constants of mixed and single-ligand complexes can be determined from spectrophotometric data. The equations for single-ligand systems are shown to be special cases of the more general mixed-ligand relations.

17460 The Equilibrium Constants and Oxidation-Reduction Potentials of Some Thiol-Disulfide Systems. Lorentz Eldjarn and Alexander Pihl. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4589-4593.

A new procedure for the determination of equilibrium constants of thiol-disulfide systems is described. The procedure was used in the study of the equilibria of five X-ray protective thiols with cystine and glutathione, respectively. The approximate practical reaction rates and the appropriate equilibrium constants were measured at *p*H 7.4 and 37 C.

17461 Thermal Decomposition of Cyclopentande-d_2 and Cyclopentane-Acetone-d_6 Mixtures. Reactions of the Allyl Radical. James R. McNesby and Alvin S. Gordon. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4593-4595.

The pyrolysis of cyclopentane is shown to be at least partly free radical. The inhibition of acetone pyrolysis by cyclopentane and the reactions of the allyl radical are discussed. It is shown that allyl radicals abstract H and D very poorly at temperatures below 400 C, but that they abstract quite well at temperatures around 500 C.

17462 Electron Coupling of Nuclear Spins. I. Proton and Fluorine Magnetic Resonance Spectra of Some Substituted Benzenes. H. S. Gutowsky, C. H. Holm, A. Saika, and G. A. Williams. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4596-4605.

High resolution magnetic resonance spectra of the ring H and the F nuclei were observed for a large number of substituted benzenes. These spectra were analyzed in detail for the simpler cases and values were obtained for the indirect coupling of the H and F nuclei by the electrons.

17463 Nuclear Magnetic Resonance Spectra of Boranes. Riley Schaeffer, James N. Shoolery, and Robert Jones. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4606-4609.

Proton and B^{11} nuclear magnetic resonance spectra of B_5H_{11} are presented.

17464 Gas Phase Reactions Activated by Nuclear Processes. Adon A. Gordus and John E. Willard. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4609-4616.

Halogens activated by neutron capture can replace H in organic compounds by unique processes.

17465 The Mechanism of Uranium Extraction by Tributyl Phosphate. H. T. Hahn. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4625-4629.

Self-diffusion coefficients of U were measured by the capillary cell technique in concentrated aqueous solutions of uranyl nitrate and in hydrocarbon solutions of the uranyl nitrate-tributyl phosphate complex. The slowest diffusion rate observed was that of the complex in a solution of tributyl phosphate and Amsco 125-90W, a kerosene diluent.

17466 Polarographic Characteristics of Osmium. I. The +8 State. Louis Meites. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4631-4637.

Information is presented concerning the reduction of +8 Os from a number of common supporting electrolytes at both dropping Hg electrodes and large stirred Hg electrodes.

17467 The Mechanism of Chemisorption: Benzene and Cyclohexane on Nickel, and the Catalytic Hydrogenation of Benzene. P. W. Selwood. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4637-4640.

Magnetization-volume adsorption isotherms were obtained for benzene and for cyclohexane on Ni-SiO_2 catalysts up to 150°.

17468 Radiation-Induced Exchange of Chlorine With Carbon Tetrachloride. John W. Schulte. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4643-4648.

The chemical and virtual changes in CCl_4 containing Cl_2 under the influence of Co^{60} γ-rays were investigated. Two reactions are observed: the exchange of Cl_2 with CCl_4 and the decomposition of CCl_4 to form C_2Cl_6 and Cl_2.

17469 The Kinetics of the NO-N_2O_5 Reaction. I. C. Hisatsune, Bryce Crawford, Jr., and R. A. Ogg, Jr. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4648-4652.

The decomposition of N_2O_5 in the presence of NO was studied with a fast-scanning infrared spectrometer at total pressures of 57 and 400 mm. using N_2 as diluent and at temperatures of 20, 25, and 30 C.

17470 Solvents Having High Dielectric Constants. VI. Diffusion in N-Methylacetamide. William D. Williams, James A. Ellard, and Lyle R. Dawson. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4652-4654.

Self-diffusion coefficients of N-methylacetamide over the temperature range 36 to 60 C, and the sodium ion in sodium chloride solutions in N-methylacetamide at 40 C, were determined. Concentrations of the salt varied from 2.5×10^{-3} to 0.25 molar.

17471 Spectra-Structure Correlations of Alkylpyridines. H. E. Podall. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1423-1426.

The alkylpyridines have characteristic infrared absorption maxima in the region from 11 to 15 μ, and characteristic band patterns in the region from 5 to 16 μ, which depend primarily upon the positions of the alkyl groups on the pyridine ring.

17472 Microebulliometer for Determination of Molecular Weight. Martin Dimbat and F. H. Stross. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1517-1520.

A microebulliometer was developed which permits relatively convenient and precise determinations of mol. wt. on as little as 10 mg. of sample added to the ebulliometer in 1- to 2-mg. increments.

17473 Annual Review of Physical Chemistry. H. Eyring, C. J. Christensen, and H. Johnston, editors. v. VIII. 527 p. 1957. Annual Reviews, Inc., Palo Alto, Calif. (QD453 R64a Vis.)

Critical reviews in 21 fields.

17474* (German.) Measurements of the Electrical Resistance and Thermoelectric Force in Chromium (III)-Oxide at Temperatures up to 1750° C. **Elektrische Widerstands- und Thermokraftmessungen an Chrom(III)-oxyd bei Temperaturen bis 1750°.** Wilhelm Anton Fischer and Gert Lorenz. *Archiv für das Eisenhüttenwesen*, v. 28, Aug. 1957, p. 497-503.

Conductivity of chromium (III) oxide from 900 to 1750 C. Calculation of the transport number of Cr^{3+} ions in chromium (III)-oxide at 1500 C. Effects of additions of metal oxides on electrical properties.

17475* Resolution and Configuration of 3-Thienylsuccinic Acid. Salo Gronowitz. *Arkiv för Kemi*, v. 11, no. 4, 1957, p. 361-371.

3-Thienylsuccinic acid was resolved into its antipodes. Its steric relationship to phenyl-succinic acid was established by the quasi-racemate method and thus it was connected to the glyceraldehyde system. Its optical rotatory power in five different solvents is of the same magnitude as the rotatory power of 2-thienylsuccinic acid.

17476 The Zirconium-Uranium Dioxide Reaction. Manley W. Mallett, John W. Droege, Arnold F. Gerds, and Alexis W. Lemmon, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1210, July 1957, 66 p. (UF767 U3b Contin.)

The solid-solid reaction between Zr and UO_2 was studied in the temperature range of 750 to 2000 F by means of welded sandwich-type elements.

17477 The Infrared and Raman Spectra of $HC(CD_3)_3$ and $DC(CD_3)_3$. J. K. Wilmshurst and H. J. Bernstein. *Canadian Journal of Chemistry*, v. 35, Sept. 1957, p. 969-979.

The Raman spectra of liquid $(CD_3)_3CH$ and $(CD_3)_3CD$ were obtained photoelectrically together with depolarization. Tentative assignments have been made for the inactive A_2 modes to explain some of the observed frequencies around 1000 $cm.^{-1}$ which could not be satisfactorily assigned as summation or difference tones.

17478 The Analysis of Nuclear Magnetic Resonance Spectra. II. Two Pairs of Two Equivalent Nuclei. J. A. Pople, W. G. Schneider, and H. J. Bernstein. *Canadian Journal of Chemistry*, v. 35, Sept. 1957, p. 1060-1072.

The proton resonance spectrum of naphthalene is reported and is analyzed as an A_2B_2 system on the hypothesis that spin couplings between protons on different rings are negligible. A complete analysis of the spectrum of *o*-dichlorobenzene, which represents a further example of an A_2B_2 system is also given. The spectrum of 1-chloro-2-bromoethane at room temperature is also analyzed as an A_2B_2 system.

17479 Chain Reactions. An Introduction. F. S. Dainton. 183 p. 1956. John Wiley & Sons, New York. (QD501 D14c)

Mathematical treatment of homogeneous, explosive, polymerization, and other types of reactions.

17480* (English.) **On the Thermal Dissociation of Organic Compounds. XII. The Effects of the Substituents on the Thermal Dissociation of Substituted Phenylureas.** Shoichiro Ozaki and Tsutomu Nagoya. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 444-449.

Eleven new ureas of the type 1,1-diethyl-3-arylureas and 1-pentyl-3-arylureas were synthesized. Rate and thermal dissociation constants of the ureas in fatty acids were determined.

17481* (English.) **Sensitization by Bismuth of the Luminescence of Manganese and Samarium in Calcium Sulfide Phosphors.** Shigeo Shionoya and Koh Era. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 518-524.

Calcium sulfide phosphors doubly activated with Bi as sensitizer and with Mn or/and Sm as activator were studied, in order to throw light on the sensitization mechanism of photoconductive phosphors.

17482* (English.) **Size and Structure of Commercial and Graphitized Carbon Blacks by Low-Angle X-Ray Scattering and Colloid-Chemical Methods.** Katsuya Inouye. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 525-531.

17483 The Thermal Decomposition of α-Lead Azide. P. J. F. Griffiths and J. M. Groocock. *Chemical Society, Journal*, Aug. 1957, p. 3380-3389.

Kinetics; reaction mechanism.

17484 Alkali Metal-Amine Solutions. Spectroscopic and Magnetic Studies. G. W. A. Fowles, W. R. McGregor, and M. C. R. Symons. *Chemical Society, Journal*, Aug. 1957, p. 3329-3336.

One or both of two intense electronic absorption bands in the visible and the infrared regions are invariably found in dilute solutions of alkali metals in amine solvents. Visible and infrared bands are allocated to excitations from paired and unpaired electrons. Factors affecting the pairing and unpairing of electrons are discussed, together with the effect of changes in environment on the absorption maxima.

17485 Photodehydrogenation and Photo-Oxidation of Some Thermochromic Ethylenes and Related Compounds. Abdel Fattah Aly Ismail and Zaki Mohammed El-Shafel. *Chemical Society, Journal*, Aug. 1957, p. 3393-3396.

A new type of thermochromic ethylene is photo-oxidized in presence of oxygen, giving anthraquinone and fluorenone; it is not affected by sunlight in a CO_2 atmosphere. A related compound (V) and a derivative are photodehydrogenated in presence of O or CO_2 with the formation of highly condensed ring-systems.

17486 Tracer Studies on Alcohols. II. The Exchange of Oxygen-18 Between *sec.*-Butyl Alcohol and Water. C. A. Bunton and D. R. Llewellyn. *Chemical Society, Journal*, Aug. 1957, p. 3402-3407.

17487 Dipole Moments and Molecular Structure. III. Some Nitro-Derivatives of Toluene. R. C. Cass, H. Speeding, and H. D. Springall. **IV. Ether Derivatives of Pentaerythritol.** I. T. Millar, C. T. Mortimer, and H. D. Springall. *Chemical Society, Journal*, Aug. 1957, p. 3451-3457.

17488 The Kineties of Oxidation of Bromide Ion in Aqueous Nitric Acid. Jean V. L. Longstaff. *Chemical Society, Journal*, Aug. 1957, p. 3488-3496.

The rate-determining step is the decomposition or rearrangement of a complex $[N_2O_3BrH]^+$.

17489 The Depolymerisation of Paraldehyde in Ethanol-Water Mixtures. The H_0 Acidity Function in This Solvent. D. P. N. Satchell. *Chemical Society, Journal*, Aug. 1957, p. 3524-3526.

Acidity-function data are presented for solutions of HCl in 24.4 mol.% ethanol-water up to concentration of 6.20M.

17490 Transport Numbers of Sodium and Potassium Iodides From Electromotive Force Measurements. F. G. Torto. *Chemical Society, Journal*, Aug. 1957, p. 3594-3597.

17491 Molecular Polarisability. The Determination of Molecular Anisotropy of Solutes From Scattering of Light by Solutions. R. J. W. LeFèvre and B. Purnachandra Rao. *Chemical Society, Journal*, Aug. 1957, p. 3644-3648.

17492 Photo- and Semi-Conductance in Organic Crystals. III. Photoeffects in Dry Air With Eleven Organic Compounds. IV. Spectral Dependence of Photocurrents in Aromatic Hydrocarbon Crystals in Dry Air With Polarized Light. L. E. Lyons and G. C. Morris. *Chemical Society, Journal*, Aug. 1957, p. 3648-3668.

17493 The Formation of Ketones. III. The Pyrolysis of Sodium Acetate and Some Sodium Dicarboxylates. R. I. Reed and M. B. Thornley. *Chemical Society, Journal*, Aug. 1957, p. 3714-3717.

Decomposition of the molten Na of acetic and α- and β-methyladipic acid is shown to be of simple, integral kinetic order, suggesting that the reactions proceed by an ionic mechanism. There is evidence for mild catalysis by carbon in all cases. Decomposition of sodium adipate, however, has the kinetic characteristics of an autocatalytic reaction.

17494* (German.) The Quenching Effect of Multiple and Mixed Halogenated Hydrocarbons. **Über die Löschwirkung von mehrfach und gemischt halogenierten Kohlenwasserstoffen.** Max Friedrich. *Chemiker-Zeitung*, v. 81, Aug. 20, 1957, p. 526-531.

Increasing the quenching effect of halogenated hydrocarbons by introducing more halide atoms. Better results with multiple halogenated methyl compounds and especially with difluorodibromoethane.

17495* (German.) Polarographic Investigation of Reaction Developments. **Polarographische Verfolgung eines Reaktionsverlaufes.** Lubor Jenšovský *Chemische Technik*, v. 9, Aug. 1957, p. 456-457.

Description of apparatus with which is it possible to follow the course of a reaction, one component of which is polarographically active.

17496* (English.) **The Velocity of Diffusion Through Porous Systems and the Conductivity of an Electrolyte in Their Pores.** E. Erdös and Z. Jírů. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 862-873.

17497* (Russian.) The Raman Spectra of Alkyltrichlorsilanes and α,ω-bis(Trichlorosilyl) Alkanes. **Spektry kombinatsionnogo rasseianiia alkiltrikhlorsilanov i α,ω-bis(trikhlorsilil) alkanov.** V. A. Kolesova and M. G. Voronkov. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 851-861.

17498* (English.) **Relations Between the Electronic Structure of Inorganic Depolarizers and Their Polarographic Behaviour. II. Complex Cyanides of Nickel.** A. A. Vlček. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 948-960.

17499* (French.) The Forms of the M Absorption Discontinuities of Gold. **Les formes des discontinuités d'absorption *M* de l'or.** Chintamani Mande. Comptes Rendus, v. 245, Aug. 5, 1957, p. 662-664.

A study of the discontinuities of M_{III}, M_{IV}, and M_V absorption of metallic gold. The form of M_{III} resembles that of L_{III}. The M_{IV} and M_V discontinuities are decomposed into three successive edges.

17500* (French.) Opposite Direction Field and Displacement of the Frequency of Vibration of a Polar Molecule in a Polar Medium. **Champ en retour et déplacement de la fréquence de vibration d'une molécule polaire dans un milieu polaire.** Louis Galatry and Friedrich G. Schuller. *Comptes Rendus*, v. 245, Aug. 26, 1957, p. 901-903.

The calculation of the relative displacement of the vibration frequency of a diatomic polar molecule in a nonpolar solvent was extended to the case of a polar solvent. The molecules of the solvent possess a permanent dipolar moment. Application of the oscillator ClH.

17501* (English.) **Mechanism of the Precipitation of Processes. XV. Some Further Experiments on the Influence of the Solvent on the Complex Solubility of Silver Halides and Silver Thiocyanate.** J. Kratohvil and B. Težak. *Croatica Chemica Acta*, v. 29, no. 2, 1957, p. 63-72.

17502* (Russian.) Absorption of Hydrogen on Nickel Layers Condensed in High Vacuum. **Adsorbtsiia vodoroda na sloiakh nikelia, kondensirovannykh v glubokom vakuume.** N. N. Kavtaradze. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 822-825.

Study of the process of H adsorption by metals.

17503* (Russian.) Statistical Theory of Crystallization. **K statisticheskoi teorii kristallizatsii.** E. A. Arinstein. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1189-1191.

Mathematical analysis.

17504* (Russian.) Computation of the Heat and Entropy of Adsorption From a Single Adsorption Isotherm. **Vychislenie teploty i entropii adsorbtsii po odnoi izoterme adsorbtsii** B. P. Bering and V. V. Serpinskii. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1254-1256.

Mathematical analysis based on a formula in combination with an analytical expression of the adsorption isotherm, provided the latter is known.

17505* (Russian.) Kinetics and Mechanism of Thermal Breakdown of Isobutylene. **Issledovanie kinetiki i mekhanizma termicheskogo raspada izobutilena.** Iu. I. Liadova, V. I. Vedeneev, and V. V. Voevodskii. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1269-1271.

Attempts to check the hypothesis that a transfer of H atoms of radicals to double olefin bonds occurs during this process.

17506 Density and Viscosity of Titanium Tetrabromide. John M. Blocher, Jr., Robert F. Rolsten, and I. E. Campbell. *Electrochemical Society, Journal*, v. 104, Sept. 1957, p. 553-555.

Measurements were made of the density and viscosity of liquid $TiBr_4$. Measurements of the vapor density at the boiling point indicate that $TiBr_4$ is monomolecular.

17507 Lattice Energies of Molten Mixtures of Electrolytes. R. P. Rastogi and K. T. Rama Varma. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1165-1170.

Solid-liquid equilibrium data for the KCl + KF, NaF + KF, NaF + NaCl, and KCl +AgCl systems is analyzed. This knowledge is used to calculate the lattice energy of molten mixtures.

17508 Spectroscopic and Thermodynamic Studies of Pyridine Compounds. I. Infrared and Raman Spectra of Pyridine and the α, β- and γ-Picolines. D. A. Long, F. S. Murfin, J. L. Hales, and W. Kynaston. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1171-1180.

17509 A Calorimeter for Measuring the Heat of Mixing of Liquefied Gases. The Heat and Excess Entropy of Mixing of Liquid Methane and Carbon Monoxide. R. A. H. Pool and L. A. K. Staveley. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1186-1197.

17510 The Water Solubilities and Heats of Solution of Short Chain Cellulosic Oligosaccharides. J. B. Taylor. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1198-1203.

Measurements at 25-65 C on cellobiose, cellotriose, cellotetraose, and cellopentaose.

17511 Catalysis of Cyclohexene Autoxidation by Trace Metals in Non-Polar Media. I. Metal Salts. II. Metal Salts in the Presence of Chelating Agents. A. J. Chalk and J. F. Smith. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1214-1245.

17512 A 26·9°C Isothermal Calorimeter and Its Application to the Measurement of Some Heats of Copolymerization of Sulphur Dioxide With Olefines, and the Reassessment of the Kinetic Data on the Butene-2 Systems. F. S. Dainton, J. Diaper, K. J. Ivin, and D. R. Sheard. *Faraday Society, Transactions*, v. 53, Sept. 1957, p. 1269-1284.

17513* (English.) **Kinetics of Isothermal Annealing of Radiation Damage in Szilard-Chalmers Reaction With Cobalt Complexes. I. Tris-Acetylacetone Cobalt (III)—Section 1.** Amar Nath, K. S. Venkateswarlu, and Jagdish Shankar. *Indian Academy of Sciences, Proceedings*, v. 46, no. 1, sec. A, July 1957, p. 29-51.

17514* (Russian.) Influence of the Structure of Alcohol Molecules on the Kinetics of Their Dehydrogenation. **Vliianie stroeniia molekul spirtov na kinetiku ikh degidrogenizatsii. I.** Alcohols C_2-C_5. **Spirty C_2-C_5. II.** Alcohols C_4-C_5. **Spirty C_4-C_5.** O. K. Bogdanova, A. A. Balandin, and A. P. Shcheglova. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 7, July, p. 787-800.

Selectivity of the effect of oxide catalyst. Study of the kinetics of dehydrogenation of *n*-propyl, allyl, ethyl, isopropyl, butyl, isoamyl, and β-phenylethyl alcohols on oxide catalyst.

17515* (Russian.) Electronic Paramagnetic Resonance in Electrolytic Solutions. **Elektronnyi paramagnitnyi rezonans v rastvorakh elektrolitov.** B. M. Kozyrev. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, no. 6, June 1957, p. 828-832.

Measurement of the width of the paramagnetic resonance line in solutions. Relation between the width of the resonance line and temperature.

17516* (Russian.) Paramagnetic Resonant Absorption of Ultrasound by Certain Salts of the Rare-Earth Elements. **Rezonansnoe paramagnitnoe pogloshchenie ultrazvuka v nekotorykh soliakh redkozemel'nykh elementov.** S. A. Al'tshuler, M. M. Zaripov, and L. Ia. Shekun. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, no. 6, June 1957, p. 844-848.

Determining the coefficient of ultrasound absorption for longitudinal waves in the ethyl sulfate salts of the following items: Pr^{3+}, Eu^{3+}, Tb^{3+}, Ho^{3+}, and Tm^{3+}.

17517* (English.) **Some Studies on Ionic Competition in Base Exchange Reactions of Homo-Ionic Montmorillonites.** S. P. Mitra and Dharam Prakash. *Japan Academy, Proceedings*, v. 33, June 1957, p. 341-345.

17518* (English.) **The Relation Between the Crystal Habit and the Lattice Image of Copper-Phthalocyanine.** Eiji Suito and Natsu Uyeda. *Japan Academy, Proceedings*, v. 33, July 1957, p. 398-402.

17519 Ternary Liquid Equilibria: Methanol-Water-Esters. R. Jagannadha Rao and C. Venkata Rao. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 435-439.

Mutual solubility and tie-line data are presented for four ternary liquid systems containing methanol, water and *n*-butyl acetate, pentyl acetate, ethyl propionate, and ethyl butyrate as solvents at 30 C.

17520* **Structure of the Methylamine Molecule. I. Microwave Spectrum of CD_3ND_2.** David R. Lide, Jr. **II. Theory of Internal Motions and Application to CD_3ND_2.** Daniel Kivelson and David R. Lide, Jr. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 343-360.

17521* Absolute Temperatures Below 1°K: Chromic Methylammonium Alum as a Thermometric Substance. E. Ambler and R. P. Hudson. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 378-389.

Gamma-ray calorimetry was used to determine the entropy-temperature relation for a single crystal of chromic methylammonium alum in the range 0.015-1 K.

17522* Vibrational Spectrum of 3,3,3-Trichloropropene-1. E. R. Shull. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 399-401.

17523* Vibrational Spectra of *sym*-Trioxane. A. T. Stair, Jr. and J. Rud Nielsen. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 402-407.

The Raman spectra of liquid *sym*-trioxane contained in a sealed, electrically heated Raman tube, and of a crystalline aggregate and a single crystal of the compound were photographed.

17524* Heats of Combustion of Some Peroxides and the Heats of Formation of Acetate, Propionate, and Butyrate Radicals. L. Jaffe, E. J. Prosen, and M. Szwarc. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 416-420.

17525* Hydrogen Bonding in Radical Reactions. Some Remarks on CF_3 Radicals. M. Szwarc and J. Smid. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 421-422.

Studies of the decomposition of acetyl or propionyl peroxide on the one hand and benzoyl peroxide on the other seem to demonstrate that Ph·COO radicals form H bonds with carboxylic acids, while the nonpolar alkyl radicals do not form such bonds.

17526* Vibrational Intensities. VIII. CH_3 and CD_3 Chloride, Bromide, and Iodide. A. D. Dickson, I. M. Mills, and Bryce Crawford, Jr. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 445-455.

17527* Lattice of Partly Permanent Dipoles. R. A. Toupin and M. Lax. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 458-464.

Electric susceptibility was determined as a function of the temperature and molecular parameters. The calculation is based on the spherical model approximation. It has a discontinuous slope at a critical temperature T_c.

17528* Vibrational Spectrum and Structure of Metal-Cyanide Complexes in the Solid State. II. $KAu(CN)_2$. Llewellyn H. Jones. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 468-472.

17529* Infrared Studies of Hydrogen Bonding of Water by the Matrix Isolation Technique. Mathias Van Thiel, Edwin D. Becker, and George C. Pimentel. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 486-490.

17530* Free Energy Functions for 54 Gaseous Elements. Harwood G. Kolsky, Ruth M. Gilmer, and Paul W. Gilles. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 494-495.

Tables of the free energy functions for 54 elements, each considered as an ideal monatomic gas, were calculated for the temperature range 0 to 8000 K.

17531* Oxygen Sorption Phenomena on Cadmium Selenide Crystals. Richard H. Bube. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 496-500.

A photostimulated, temperature-dependent, reversible sorption of O on CdSe crystals, pretreated to produce donor centers in the surface layers, was investigated through its effect on the measured dark conductivity.

17532* Nonstoichiometry and Lattice Defects in Uranium Hydride. George G. Libowitz. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 514-518.

The energy necessary to form a H vacancy was found to be 68.2 kcal./mole, while a value of 6.5 kcal./mole was determined for the interaction energy between vacancies.

17533* Thermodynamics of the Ta-O System: The Dissociation Energies of TaO and TaO_2. Mark G. Inghram, William A. Chupka, and Joseph Berkowitz. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 569-571.

Energy values obtained at zero K are 8.4 ± 0.5 and 15 ± 0.5 e.v.

17534* Formulas for Thermal Conductivity of Ternary Gas Mixtures. B. N. Srivastava and S. C. Saxena. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 583-584.

17535 Infra-Red Spectra of Inorganic Solids. II. Oxides, Nitrides, Carbides, and Borides. Edward G. Brame, Jr., John L. Margrave, and Villiers W. Meloche. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 48-52.

Spectra from 2 to 16 μ were determined and then examined for possible relationships.

17536 Bond Length and Bond Energy in Hydrocarbons. Hans Feilchenfeld. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1133-1135.

Bond energy is inversely proportional to the cube of the bond length.

17537 Formation Constants and Hydrolysis at 100° of Calcium and Magnesium Complexes of Adenosinetri-, Di- and Monophosphate. L. B. Nannings. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1144-1149.

17538 Argon-Xenon Layer Formation on Graphitized Carbon Black From 65 to 80 K. C. F. Prenzlow and G. D. Halsey, Jr. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1158-1165.

Argon isotherms were determined in order to calculate the energies and entropies of adsorption of A on bare P-33(2700) carbon black, the same black covered with one layer of preadsorbed Xe, and with six layers of Xe.

17539 Electric Free Energy and the Deformation of Droplets in Electrically Conducting Systems. Chester T. O'Konski and Frank E. Harris. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1172-1174.

Experimental results suggest possible methods for measuring interfacial tensions, and for determining the low frequency dielectric constants of systems possessing high conductivity.

17540 The Gas Phase Constitution of Boric Oxide. Milton D. Scheer. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1184-1188.

Molecular weight and vapor pressure were measured by determination of the weight and exerted force of the vapor effusing through two small circular orifices.

17541 Physical Properties of Monolayers Adsorbed at the Solid-Air Interface. II. Mechanical Durability of Aliphatic Polar Compounds and Effect of Halogenation. O. Levine and W. A. Zisman. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1188-1196.

17542 The High Temperature Oxidation of Silicon. J. T. Law. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1200-1205.

The oxidation of Si from 1000 to 1300 K, and for oxygen pressures in the range 7×10^{-3} to 5×10^{-2} mm. obeys a form of the parabolic law which means that the rate-determining step is the diffusion of some reactant species through the oxide film. Removal of the oxide film by flashing was studied as a function of flashing temperature.

17543 The Decomposition Reactions of the Formyl and Acetyl Free Radicals. Jack G. Calvert. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1206-1213.

17544 The Condensation Coefficient of Iodine. J. H. Stern and N. W. Gregory. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1226-1232.

Condensation coefficient was determined by a comparison of steady-state pressures established in effusion cells having various orifice sizes and dimensions.

17545 Homogeneous Catalytic Activation of Molecular Hydrogen in Aqueous Solution by Silver Salts. II. High Temperature Hydrogenation and Exchange Studies. III. Precipitation of Metallic Silver From Solutions of Various Silver Salts. A. H. Webster and J. Halpern. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1239-1248.

17546 Chemical Effects of Plastic Deformation at High Pressure. H. A. Larsen and H. G. Drickamer. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1249-1252.

During plastic deformation at pressures from 3000 to 50,000 atm. solid potassium hexacyanoferrate(III) is rapidly converted to potassium hexacyanoferrate(II) and other products. Pressure alone without plastic deformation causes no appreciable reaction in this system. Two possible mechanisms for the specific influence of lattice distortion are postulated.

17547* High Pressure Vapour-Liquid Equilibria of Non-Ideal Solutions. IV. Cyclohexane—*n*-Propanol. V. N. Kumarkrishna Rao, D. R. Swami, and M. Narasinga Rao. *Journal of Scientific & Industrial Research*, v. 16, sec. B, July 1957, p. 294-299.

Data for pressures up to 15 atm. Empirical correlations of the shift of azeotrope with pressure and temperature.

17548* (German.) Electrical Atomization of Silicon in Ketone. **Die elektrische Zerstäubung von Silicium in Aceton.** Hans Kautsky, Jr. *Kolloid-Zeitschrift*, v. 153, Aug. 1957, p. 109-127.

Formation of colloidal solutions by means of high-voltage short circuit sparks between small pieces of Si in ketone under H-free N. Chemical transformation of Si into colloidal Si compounds.

17549* (Russian.) Experimental Investigation of the Heat Conductivity of Aqueous Solution of Electrolytes. **Eksperimental'noe issledovanie teploprovodnosti vodnykh rastvorov elektrolitov.** Iu. P. Os'minin. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii*, v. 12, no. 2, 1957, p. 117-125.

Investigation of heat conductivity of aqueous solutions of acids, salts, and alkalies of various concentrations and at various temperatures. Analysis of some formulas of liquid heat conductivity applicable for electrolytes.

17550* (Russian.) Investigation of Dependence of Catalytic Activity on Structure and Composition of Catalytic Copper on Aluminum Oxide. **Issledovanie zavisimosti kataliticheskoi aktivnosti ot struktury i sostava katalizatora med' na okisi aliuminiia. III.** A. E. Agronomov and A. A. Dulov. *Moscow. Universitet, Vestnik, Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii*, v. 12, no. 2, 1957, p. 215-222.

Investigation of several Cu-Al_2O_3 catalysts containing up to 100% Cu. Determination of activity in dehydrogenation of cyclohexanol at four different temperatures in the 160-220 C range. Calculation of apparent energy of activation. Determination of catalyst structure by adsorption method. Adsorption study of thiophene catalytic poison.

17551 Infrared Dispersion of Liquids by Critical Angle Refractometry. Joseph H. Jaffe and Uri Oppenheim. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 782-784.

Arsenic trisulfide prisms were used. In determining the critical angle of refraction, the influence of fringes formed in the thin sample layer was taken into account. Dispersion data are presented for six solvents in the 1-6μ region.

17552 (English.) **Interstitial Diffusion of Copper in PbS Single Crystals.** J. Bloem and F. A. Kröger. *Philips Research Reports*, v. 12, Aug. 1957, p. 281-302.

At temperatures $100 < T < 500$ C, Cu can diffuse rapidly into PbS via interstitial sites. Existing cation vacancies are filled by Cu, while Cu may also be bound by S at internal surfaces (cracks, dislocations). The diffusion coefficient follows the relation $D_{Cu}=5.10^{-3}$ exp (-7130/RT) $cm^2\ sec^{-1}$.

17553 (English.) **Interstitial Diffusion of Nickel in PbS Single Crystals.** J. Bloem and F. A. Kröger. *Philips Research Reports*, v. 12, Aug. 1957, p. 303-308.

Under reducing conditions, Ni may penetrate into PbS crystals at temperatures $T < 500$ C; it diminishes *p*-type conductivity and may cause *n*-type conductivity. Under sulfurizing conditions (H_2S) the Ni can be drawn out of the crystal and the original conductivity restored.

17554 Theoretical Treatment of the Kinetics of Diffusion-Limited Reactions. T. R. Waite. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 463-470.

Probability densities; change of the joint probability densities due to diffusion; differential equation for the joint probability density; boundary conditions; Smoluchowski boundary condition; radiation boundary condition.

17555 Infrared Absorption of Oxygen in Silicon. H. J. Hrostowski and R. H. Kaiser. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 966-972.

Spectra taken between 4.2 and 297 K show an unusual temperature-dependent fine structure in the most intense band at 1106 cm^{-1}. Isotopic shifts were observed at low temperatures in samples enriched with O^{18}.

17556* (English.) **Studies on Explosive Reactions of Tetrafluoroethylene and Acetylene With Oxygen or Air.** Ryo Kiyama, Jiro Osugi, and Sigeru Kusuhara. *Review of Physical Chemistry of Japan*, v. 27, no. 1, 1957, p. 22-41.

Studies by means of "admission" method in which gaseous samples were flowed into a hot evacuated vessel.

17557* The Ion- and Electron-Exchange Properties of Activated Carbon in Relation to Its Behaviour as a Catalyst and Adsorbent. V. A. Garten and D. E. Weiss. *Reviews of Pure and Applied Chemistry*, v. 7, June 1957, p. 69-122.

17558* (French.) Applying Electrochemical Methods to the Study of the Structure of Colloidal Sols. **Application des méthodes électrochimiques à l'étude de la structure des sols colloidaux. III.** Aging of Arsenic Sulfide Sols. **Sur le vieillissement des sols de sulfure d'arsenic.** Jacques Gilbert. *Société Chimique de France, Bulletin*, 1957, nos. 8-9, Aug.-Sept., p. 1046-1053.

The arsenic sulfide salts, obtained by mixing arsenious and sulfhydric solutions, cannot be electrochemically reproduced from one sample to the other, due to rapid aging. The appearance of sulfuric acid is explained.

17559* (French.) Synthesis of 2,3-Dimethyl-D-Lyxose. **Synthèse du 2,3-dimethyl-d-lyxose.** J. P. Verheijden and P. J. Stoffyn. *Tetrahedron*, v. 1, no. 3, 1957, p. 253-258.

2,3-Dimethyl-D-lyxose was synthesized from lyxose and its structure confirmed by oxidation with periodic acid. The product obtained by degradation of 3,4-dimethyl-galactosamine with ninhydrin was shown to be indistinguishable by paper chromatography, from synthetic 2,3-dimethyl-D-lyxose.

17560* (Russian.) Electrochemical Adsorption of Ions by Carbon From Aqueous Solutions With Various Concentrations of Electrolytes. **Elektrokhimicheskaia adsorbtsiia ionov uglem iz nevodnykh rastvorov pri razlichnykh kontsentratsiiakh elektrolitov.** V. A. Lunenok-Burmakina. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 431-436.

Study of the effect of acetone and ether acetate, taken in various quantities, on the electrochemical adsorption of Li^+, Ca^{2+} and Sr^{2+} cations by platinized hydrogenous C from 0.1-0.01 *N* and 0.00005-1 *N* aqueous solutions of Cl salts.

17561* (German.) Experimental Investigations of the Effect of Concentration and Temperature on the Viscosity of Aqueous Solutions of Strong Electrolytes. **Experimentelle Untersuchungen über die Konzentrations-und Temperaturabhängigkeit der Zähigkeit wässriger Lösungen starker Elektrolyte. III.** KCl-, K_2SO_4-, $MgCl_2$-, $BeSO_4$-, and $MgSO_4$-Solutions. **KCl-, K_2SO_4-, $MgCl_2$-, $BeSO_4$- und $MgSO_4$-Lösungen.** Manfred Kaminsky. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 12, Aug. 1957, p. 206-231.

General considerations on the viscosity of electrolytic solutions; measuring methods and instruments. Conclusions on ionic interaction, hydration effect, hydrolysis, polarization, and negative values of the temperature coefficient.

17562* (English.) **A Study on the Complex Compound Formation Between Bivalent and Univalent Salts in Solution. The System: $HgCl_2$-NH_4Cl-H_2O.** R. C. Aggarwal. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 207, June 1957, p. 1-7.

Studies of freezing point depression, conductivity, viscosity and pH show the existence of the two compounds, NH_4HgCl_3 and $(NH_4)_2HgCl_4$.

17563* (English.) **Mixed Emulsifying Agents.** L. N. Mukerjee and J. P. Barthwal. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 207, June 1957, p. 17-26.

Study of the dispersion and stability of emulsions stabilized by $Al(OH)_3$ or bentonite together with varying concentrations of gelatin, sodium oleate, or gum acacia.

17564* (English.) **The Evaporation of Oxide Coated Cathodes. I.** J. Ádám, K. Ettre, Gy. Gergely, and P. F. Váradi. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 207, June 1957, p. 70-80.

Evaporation of Ba, Sr, and Ca was studied by a flame-photometric method.

17565* (Russian.) Studying the Equilibrium of GeO_2 Vapor Tension. **Izuchenie ravnovesnykh uprukostei para dvuokisi germaniia.** V. I. Davydov. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1460-1466.

Knudsen effusion method used in the study showed the following: vapor tension of GeO_2 reached 10^{-3} to 10^{-2} mm. Hg at 1150 to 1350 K, with practically no dissociation of Ge and O_2, transformation of GeO_2 from tetragonal to hexagonal takes place at 980 C.

17566* (Russian.) Studying the System $Co(ClO_4)_2$-Li_2Br_2-H_2O-Acetone by the Physico-Chemical Analysis Method. **Issledovanie sistemy $Co(ClO_4)_2$-Li_2Br_2-(H_2O)-atseton metodami fiziko-khimicheskogo analiza.** M. S. Barvinok. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1423-1428.

Determination of light absorption, electric conductivity, viscosity, and density of solutions. Reactions between the salts in this system. Formation of $CoBr_2$, $CoBr_2$.LiBr, and $CoBr_2$.2LiBr.

17567* (Russian.) Transition of a Single Phase Medium in Two Phases Under the Action of Heat. **Perekhod odnofaznoi sistemy v dvukhfaznuiu pod deistviem teplovogo istochnika.** V. S. Khomenko. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1534-1539.

Mathematical analysis.

See also: **17274** (mechanism of acid-catalyzed reactions); **17290** (thermodynamic properties of hydrocarbons); **17437** (intramolecular hydrogen bonding).

COATINGS

17568* Sprayed Molybdenum and Its Applications. Sheila M. Wright. *Alloy Metals Review*, v. 8, Sept. 1957, p. 2-8.

Major applications are to be found in reclamation work of either worn or undersize parts, either alone or in conjunction with another sprayed metal. Spraying techniques are described.

17569 Recently Developed Aqueous Gloss Finishes. R. L. Durr. *American Paint Journal*, v. 42, Sept. 23, 1957, p. 106 + 6 pages.

Requirements and some specific formulations are presented.

17570 Direct Colorimetric Determination of Nitrocellulose in Lacquers. M. H. Swann. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1504-1505.

The yellow color formed by reaction of nitrocellulose with alkali in the presence of acetone provides a simple and rapid method for the direct analysis of lacquers.

17571 Determination of Cellulose Resins in Coatings by Colorimetric Cellulose Analysis. M. H. Swann. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1505-1506.

Anthrone reagent was used. In the absence of nitrocellulose, the cellulose esters and ethers can be determined in coatings without interference from other resins or plasticizers.

17572* Automatic Resurfacing of Steel-Mill Rolls by Welding. A. Smarcan. *Brown Boveri Review*, v. 44, June-July 1957, p. 276-285.

Methods of reconditioning rolls; type of electrode material; equipment and shop procedure.

17573 Kinetics of Growth of the Diffusional Layer in the Boronizing of Steel. V. D. Taran and L. P. Skugorova. *Henry Brutcher Translation No.* 3976, 7 p. (From *Fizika Metallov i Metallovedenie*, v. 3, no. 1, 1956, p. 66-69.) Henry Brutcher, Altadena, Calif.

Relation between thickness of boronized layer and time of boronizing; rate of boronizing as function of temperature; effect of steel composition on rate of diffusion of B.

17574 Chromizing of Wood-Cutting Tools. A. P. Polishchuk. *Henry Brutcher Translation No.* 3998, 6 p. (From *Stanki i Instrument*, v. 28, no. 4, 1957, p. 29-30.) Henry Brutcher, Altadena, Calif.

Wear resistance of various Cr or V wood-cutting tools was trebled by chromizing. Chromizing practice. Effects of treating temperature and time.

17575* Sherwin-Williams New Research Station for Evaluation of Exterior Finishes. H. Kredentser. *Chemistry in Canada*, v. 9, Aug. 1957, p. 40 + 1 page.

Description of facilities and work in progress.

17576 The Properties and Uses of Some Organic Compounds of Titanium. W. B. Anderson. *Chemistry in Canada*, v. 9, Sept. 1957, p. 44-46.

Some uses of TiO_2 based on its ability to whiten, brighten, and opacify while contributing to durability. Production of titania porcelain enamel.

17577 The Painting of Cathodically Protected Surfaces. D. M. MacDonald. *Chemistry in Canada*, v. 9, Sept. 1957, p. 64 + 3 pages.

Corrosion theory and the theory of cathodic protection are briefly outlined to illustrate the necessity of using alkali resistant paints for coating protected surfaces. Experimental work carried out in an effort to overcome the adhesive failures experienced with vinyl paints is described. Recommendations are made for surface preparations and painting using existing materials.

17578 How to Specify Organic Coatings. Allen L. Alexander. *Consulting Engineer*, v. 9, Oct. 1957, p. 86 + 7 pages.

Shortcomings and advantages of polymeric coating materials with emphasis on the resin types which go into anticorrosive coatings.

17579* Porcelain Enamel Research. II. *Corrosion Prevention and Control*, v. 4, Sept. 1957, p. 51-54.

Results of exposure tests.

17580* Red Lead in the Protection of Iron and Steel. VI. H. Masseille. *Corrosion Prevention and Control*, v. 4, Sept. 1957, p. 41-43.

Health safeguards; preparation methods; specifications recommended.

17581 Spray Painting With Compressed Air Atomisation. A. A. B. Harvey. *Electroplating and Metal Finishing*, v. 10, Sept. 1957, p. 273-278.

Spray gun operation; defective spray patterns; choosing a spray gun; automatic spraying. (To be continued.)

17582 Black Oxide Coatings on Steel: Quality Tests. J. Doss. *Electroplating and Metal Finishing*, v. 10, Sept. 1957, p. 289-290.

An oxalic acid spot test is recommended.

17583 Spraywelding—A Hard Facing Preventive Maintenance Process. J. R. Smith. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 90-95.

The process; finishing the overlay; engineering data; metals that can be spraywelded; applications. Advantages include savings in time and material.

17584* A Process for the Deposition of Molybdenum Inside Large-Bore Tubing. A. Hegarty. *Metal Finishing*, v. 3, Sept. 1957, p. 349-352.

Process and equipment for vapor plating. Effect of variables on plating quality.

17585* Exterior House Paint. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Sept. 1957, p. 836-894.

A symposium presented by a panel representing the American Zinc Institute. Papers and questions from the group are reported.

17586* Solvent Selection for Paint. D. J. Rasmussen. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Sept. 1957, p. 895-906.

Viscosity reduction measurement made with a specific resin and solvent are much more reliable than estimates of solvency based on the aniline point, mixed aniline point, or Kauri-Butanol value of the solvent.

17587 The Oxidation and Drying Properties of Styrenated Alkyds. E. A. Bevan, M. J. Heavers, and W. R. Moon. *Oil and Colour Chemists' Association, Journal*, v. 40, no. 9, Sept. 1957, p. 745-760.

17588 A Study of Paint Vehicles. I. L. Dintenfass. *Oil and Colour Chemists' Association, Journal*, v. 40, no. 9, Sept. 1957, p. 761-785.

The viscosities of a number of commercial oils, resins, and other paint vehicles were determined in various solvents and solvent mixtures. The viscosity of any paint vehicle was found to be greatly dependent on the solvent power of the solvent. Thixotropy and dilatancy can be controlled by changes in solvent power.

17589* Urethane Coatings—Tough, but Temperamental. Herman B. Wagner. *Organic Finishing*, v. 18, Sept. 1957, p. 8-11.

Composition, properties, and application of urethane coatings.

17590* Better Appliance Finishes by Flow-Coating With Epoxies. E. F. H. Strauss. *Organic Finishing*, v. 18, Sept. 1957, p. 15-18.

Describes a flow-coating installation where a relatively new epoxy resin coating is offering still another advantage, chemical inertness.

17591 Formulating Paints With Chlorinated Rubber. H. E. Parker. *Paint Manufacture*, v. 27, Sept. 1957, p. 333-335.

Properties and methods of preparation of chlorinated rubber. Formulas for corrosion-resistant and fire-retardant paints. Use of chlorinated rubber in mold-resistant finishes.

17592 Storage Stability of Polyvinyl Acetate Emulsion Paints. I. H. W. Chatfield. *Paint Manufacture*, v. 27, Sept. 1957, p. 340-343.

Factors affecting shelf life include type of stabilizer or thickener, type of wetting agent, relative amounts of stabilizer and thickener, and degree of pigmentation.

17593 Silicones in Protective Coatings. *Paint Manufacture*, v. 27, Sept. 1957, p. 358-359.

Effectiveness of organic silicone water repellents in limiting water absorption in brick and concrete; other applications of silicones in the protective coatings field.

17594* Optical Effects of TiO_2 Upon Industrial Finishes. W. S. Castor and L. A. Melsheimer. *Paint and Varnish Production*, v. 47, Sept. 1957, p. 29 + 8 pages.

Properties of anatase and rutile pigments.

17595* What Are the Qualities of a Good Asphalt Pipe Coating. Lloyd F. Bramble. *Pipe Line News*, v. 29, Sept. 1957, p. 63 + 4 pages.

Considers the entire complex of deteriorative influences which come into play the moment a pipeline is cleaned, coated, wrapped, lowered into the ground, and backfilled.

17596 Titanium-Clad Steel. R. F. Domagala, D. W. Levinson, and W. Rostoker. *Product Engineering*, v. 28, Sept. 1957, p. 111-113.

Progress report on roll-cladding steel with a thin layer of Ti.

17597* Phosphating Processes and Their Applications in Metal Finishing. IV. Typical Processes. D. J. Fishlock. *Product Finishing*, v. 10, Sept. 1957, p. 94 + 11 pages.

Phosphating treatments for paint bonding to Al, Mg, Zn, and Cd; anti-corrosion treatments for spring steel, threaded parts, and massive structures; engineering applications.

17598* (Polish.) The Influence of Triphenylmethyl and Benzoyl Peroxide on Polymerization and Drying of Linseed and Tung Oils. **Wpływ trójfenylometylu i nadtlenku benzoilu na polimeryzacje i schnięcie olejów inianego i tungowego.** Z. Jedliński and T. Umiński. *Przemysł Chemiczny*, v. 13, no. 7, July 1957, p. 401-405.

Free radicals accelerate drying of tung oil and its thermal polymerization. The influence of free radicals on drying linseed oil confirms the hypothesis of a different mechanism of drying in these two oils.

17599* (Russian.) The Effect of Fillers on the Properties of Bituminous Anticorrosion Coatings. **Vliianie napolnitelei na svoistva bitumnykh antikorroziinykh pokrytii.** V. I. Zhukov and A. A. Kozlovskaia. *Stroitel'stvo Predpriiatii Neftianoi Promyshlennosti*, v. 2, no. 8, Aug. 1957, p. 11-14.

The M-IV bitumens used for an insulating mastic are saturated with water. Degree of saturation depends on the mineral part present in the bitumen. Highly-plastic bitumens are recommended for obtaining coatings with high operating durability. Limestone, crumb rubber, and P-200 polyisobutylene are suggested as fillers.

See also: **17204** (tall oil characteristics); **17573** (diffusion of boron in steel); **17794** (paint markets); **18047** (cavitation-erosion properties of galvanized and nitrided steel); **18095** (Al surface treatment); **18553** (ventilation equipment).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

17600* How to Increase Contact Reliability. S. T. East. *Automatic Control*, v. 7, Sept. 1957, p. 14 + 4 pages.

Many factors affect the performance of switches, contactors and relays in control circuits. Results of an analysis of most apparent sources of contact malfunctions are analyzed.

17601* Achieving Reliability by Automatic Repair. Richard J. Herman. *Automatic Control*, v. 7, Sept. 1957, p. 19-21.

A technique which the user can apply to achieve continuous operation of parallel control systems. Analysis is based upon existence of an automatic switch activated by the failure of a component.

17602* System Reliability Through Reliable Design. K. A. Pullen. *Automatic Control*, v. 7, Sept. 1957, p. 22-24.

Specific circuits which achieve system reliability are described in this study of the elements in a remote control system.

17603* Computer Control From Engineering Test Data. Harry E. Burke, Jr. *Automatic Control*, v. 7, Sept. 1957, p. 62-67.

Addition of high speed instrumentation system (including a digital computer) makes it possible for aircraft test engineers to plan test programs from fully reduced data as they proceed with the problem at hand.

17604* Synthesis of Systems for Hydraulic Control of Automatic Machinery. II. Selection and Evaluation of Hydraulic Pumps and Actuators. R. Hadekel. *Automation*, v. 4, Oct. 1957, p. 54-59.

17605* Control Transformers Designed for Automatic Production. Stanley J. Antalis. *Automation*, v. 4, Oct. 1957, p. 73-79.

Redesigned line of control transformers demonstrates influence of automation on product design.

17606 Basic Automatic Control Theory. Gordon J. Murphy. 557 p. 1957. D. Van Nostrand Co., Princeton, New Jersey. (TJ213 M95b)

Basic theory pertinent to the analysis and synthesis of linear control systems having fixed, lumped parameters and subject to specifiable input commands and disturbances.

17607* High Speed Analogue-to-Digital Converters. G. J. Herring and D. Lamb. *British Institution of Radio Engineers, Journal*, v. 17, Aug. 1957, p. 407-420.

Some control and computing problems are discussed in which advantage may be gained by encoding analog quantities into digital form for subsequent processing. A voltage-to-digital converter was designed for use with an electronic analog computer in order to combine analog and digital computation techniques.

17608* Computing Applications Where Analogue Methods Appear to be Superior to Digital. R. J. Comperts. *British Institution of Radio Engineers, Journal*, v. 17, Aug. 1957, p. 421-429.

Analog methods are superior in the computation of non-linear heat flow, noise analysis, and the Monte Carlo method for solving neutron collision problems.

17609* Synchros—Use, History, and Description. Harry Rosenberg. *Bureau of Ships Journal*, v. 6, Oct. 1957, p. 9-13.

Design, operation, and applications.

17610 Servo Modulators. II. Electromechanical, Electronic, and Semiconductor-Diode Units. Basil T. Barber. *Control Engineering*, v. 4, Oct. 1957, p. 96-104.

Typical circuits, performance characteristics, and application data.

17611* The Design of Sampling Servomechanisms. I. S. Demczynski. *Electrical Energy*, v. 1, Sept. 1957, p. 410-414.

Methods applicable for the analysis and synthesis of linear sampling servomechanisms are briefly reviewed. (To be continued.)

17612* Cycle Counting for Digital Timing Control. J. L. Solomon. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 96 + 6 pages.

Detailed circuits as well as the over-all block diagram are included in a description of the use of beam switching tubes as the nucleus of a system for counting power line cycles as a means of measuring time intervals.

17613 Approximating Non-Linear Functions by Shunt Loading Tapped Potentiometers in Analogue Computing Machines. D. W. C. Shen. *Electronic Engineering*, v. 29, Sept. 1957, p. 434-439.

Simulation of non-linear functions in the aerodynamic section of an analog computer can be achieved by linear interpolation techniques.

17614 A Unique Approach to Computer Versatility. L. S. Michels. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 72 + 7 pages.

Design and operation of an integrated dual computer system with unique operating possibilities, a result of shared memory and input/output facilities.

17615 High-Speed Computer Stores 2.5 Magabits. William N. Papian. *Electronics*, v. 30, Oct. 1, 1957, p. 162-167.

Development of a transistorized arithmetic and control unit operating at a 5-megapulse-a-second clock rate, a 2.5-million-bit, 6-micro-second internal memory, and a 64-register storage unit of index registers and program counters provides the basic units that make up the largest memory computer built to date.

17616 Strain Gage System for Aircraft Telemetering. William O. Brooks and Dwight L. Stephenson. *Electronics*, v. 30, Oct. 1, 1957, p. 170-173.

High-accuracy transistorized strain-gage system for aircraft and missile applications has 1% linearity and provides 0 to 5-volt d.c. output suitable for subcarrier oscillator modulation in F.M. telemetering systems. Bridge excitation supply powers three parallel gages having total resistance of 40 ohms.

17617* (Russian.) Transformer Operation of Selsyns. **Transformatornye rezhimy sel'sinov.** G. I. Shturman. *Elektrichestvo*, 1957, no. 8, Aug., p. 32-37.

Output currents and voltages of the transformer. Losses in the selsyn windings.

17618* (Czech.) Servomechanisms and Their Parts. **Servomechanismy a jejich součásti.** Zdeněk Dráb. *Elektrotechnik*, v. 12, no. 8, Aug. 1957, p. 247-252.

Brief fundamental information on servomechanisms, their importance, and application; also their parts and properties.

17619 Establishing an Integrated Data-Processing System. Blueprint for a Company Program. Special Report No. 11. 183 p. 1956. American Management Assn., New York. (HD28 Am35s Vis.)

Recognizes that electronics is not the last word in data processing and that the principle of integration in effective data processing would not be invalidated by even more efficient systems.

17620 The Small Digital Computer as a Research Tool. Joseph D. Grandine. *Industrial Laboratories*, v. 8, Oct. 1957, p. 51-56.

17621 The Noise Problem in a Coincident-Current Core Memory. Frank McNamara. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 153-156. (TK1 In6.6i Contin.)

A compact, completely-transistorized magnetic core memory with a storage capacity of over 130,000 bits is described.

17622 Checking Circuits and Diagnostic Routines. J. Presper Eckert, Jr. *Instruments and Automation*, v. 30, Aug. 1957, p. 1491-1493.

Procedures for Eniac, Binac, and Univac systems.

17623 Controlling the Pure-Delay Plant. John Wood. *Instruments and Automation*, v. 30, Sept. 1957, p. 1720-1722.

Interrupted control, a new control mode which has proved efficient for tough control situations, is described.

17624 Multiple-Address Magnetic-Tape Transport. George E. Comstock. *Instruments and Automation*, v. 30, Sept. 1957, p. 1725-1728.

System can be used with reel-type digital magnetic-tape transports, high-speed printers, digital computers, and other high-speed electronic data processing equipment as a medium-access-time, random-access memory and to provide fast sorting of digital information.

17625 Digital Compensation for Control and Simulation. Julius Tou. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1243-1248.

Describes a technique for improving the performance of digital feedback control systems and operational digital simulators by making use of the computer to perform information programming or data processing. The system stability can be improved and the system error can be reduced by digital programming of the input and error signals together with digital correction computations.

17626 On the Simulation of Random Excitations for Airplane Response Investigations on Analog Computers. Bernard Mazelsky and Harry B. Amey, Jr. *Journal of the Aeronautical Sciences*, v. 24, Sept. 1957, p. 633 + 17 pages.

A method of electrical simulation which permits evaluations of a wide class of aircraft dynamic problems involving random excitations (gust loads, taxi loads, buffeting, fatigue, etc.), much of which cannot be treated conveniently by present mathematical techniques. The statistical properties of the random excitation e.g., the power spectrum and probability distribution are simulated through appropriate synthesis of electrical circuitry with the output of a commercially available noise generator.

17627* (German.) Magnetic Switching Circuits for the Representation of Logical Relationships. **Magnetische Schaltkreise zur Darstellung logischer Verknüpfungen.** H. Gillert. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, Aug. 1957, p. 391-402.

Systematic investigation of a circuit function containing two and three variables. A binary series-adding and series-substracting network is given as an example.

17628 Numerical Control. 114 p. 1957. The Aircraft Industries Association of America, Inc., Washington, D. C. (TJ1204 Ai74n)

Report on a survey of the various types of machine tool control systems now available or under development.

17629 Automation Today. XII. Theodore J. Williams. *Petroleum Refiner*, v. 36, Sept. 1957, p. 315-318.

A review showing how components of a computer simulate mathematical equations.

17630* An All-Electric Control System for Maximizing Flow Through a Multiple Station Pipe Line. B. E. Ewers and H. B. Rath. *Pipe Line News*, v. 29, Sept. 1957, p. 44-48.

17631 Some Aspects of the Early History of Automation. W. H. Chaloner and W. O. Henderson. *Research*, v. 10, Sept. 1957, p. 335-340.

Post-World War II developments in this field are reviewed,

17632 The Use of Computers. M. Woodger. *Research*, v. 10, Sept. 1957, p. 345-349.

Attempts to provide information, at present not readily available, on the kind of problems that can best be solved by using computers.

17633 Electronic Control Techniques in Aircraft Manufacture. I. G. S. Kermack and H. Ogden. *Royal Aeronautical Society, Journal*, v. 61, Sept. 1957, p. 609-618.

A system for control of metal cutting machine tools.

17634 Controlling the Digital Computer. R. W. Hamming. *Scientific Monthly*, v. 85, Oct. 1957, p. 169-175.

Leads to an interpretive language, a new language of communication, which is designed by the user to make it easier for him to control the computer.

17635* Process Development and Plant Design. The Role of Instrumentation With Particular Reference to the Applications of Computers. S. T. Lunt. *Society of Instrument Technology, Transactions*, v. 9, Sept. 1957, p. 87-103.

Factors which determine the choice of the most suitable calculating machine for a fundamental or empirical application.

17636* System Design of the Sperry Digital Computer Facility. Herbert Freeman. *Sperry Engineering Review*, v. 10, July-Aug. 1957, p. 13-19.

Development of an electronic computer expressly designed to perform the routine engineering calculations in a large engineering organization.

17637 Logic—A Flux Data Processing Code for the IBM-650. Betty L. Anderson. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-TM-68, June 1957, 14 p. (UF767 Un3.1wa Contin.)

Logic is a code designed to use fixed point flux data to perform either a least squares log fit or to punch out from one to three decks of cards to be used as input to COFIT or EXFIT codes.

See also: **17110** (wind tunnel data handling equipment); **17263** (automatic proportioning system); **17818** (computers for food firms); **17886** (automatic control of photographic printing); **17959** (automatic auto door assembly line); **18218** (tape control of machining operations); **18273** (gages for automatic machine control).

ELECTRICAL ENGINEERING

17638* High-Temperature Transformers. J. T. Watson. *British Communications & Electronics*, v. 4, Oct. 1957, p. 633-634.

Transformer capable of reliable operation at ambient temperatures up to 200 C has winding temperature of 250 C.

17639* Series Capacitors. L. Clarke and H. Walker. *Electrical Energy*, v. 1, Sept. 1957, p. 396-404.

Design and use.

17640* A Review of Protective Gear Practice in Great Britain. I. C. H. Lackey. *Electrical Energy*, v. 1, Sept. 1957, p. 406-409.

Reviews current British practice in the protection of large electrical power systems. (To be continued.)

17641* (Russian.) On Calculating Electromagnetic Forces in Transformer Windings. **O raschete elektrodinamicheskikh sil v obmotkakh transformatorov.** I. M. Postnikov. *Elektrichestvo*, 1957, no. 8, Aug., p. 9-15.

Axial forces in symmetrically arranged windings and in windings of unequal lengths. Expressing the forces by the relative parameters of the short-circuit. Axial compression and radial forces.

17642* (Russian.) Electro-Mechanical Transients in Synchronous Machines. **Elektromekhanicheskie perekhodnye protsessy v sinkhronnykh mashinakh.** A. A. Ianko-Trinitskii. *Elektrichestvo*, 1957, no. 8, Aug., p. 16-21.

Equation of the transients. The Liapunov function and its application. Calculation of periodic motion and repeated disturbances.

17643* (Russian.) Highly Sensitive Vacuum Relay. **Vysokochuvstvitel'noe vakuumnoe rele.** K. P. Egorov, V. G. Krasin'kov, and L. V. Reiman. *Elektrosviaz'*, v. 11, no. 9, Sept. 1957, p. 58-64.

Design, construction, and application.

17644* (Czech.) Single-Phase Traction Motor for a Frequency of 50 cps With Indirect Resistance Connections. **František Sedlák.** *Elektrotechnický Obzor*, v. 46, no. 7, July 1957, p. 340-346.

Explains a new principle of resistance connections of the armature winding with the commutator, based upon the fact that the resistances are not inserted directly into the connections but linked to them through transformers. Motor design data is given.

17645* (Czech.) The Protection of Small Generators. **O ochraně malých generátorů.** Alois Maděra and František Fritscher. *Elektrotechnik*, v. 12, no. 8, Aug. 1957, p. 253-255.

Simple and economical protection of small generators by a relay connected into the generator circuit. It disconnects the exciting current in case of a short-circuit without interfering with the voltage regulator.

17646 Setting Up a Standardization Laboratory for Electrical Measuring Instruments. J. O. Reece and P. Greenspan. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 78-84. (TK1 In6.6i Contin.)

Design of a laboratory for an industrial plant.

17647 A New High Stability Micromicroammeter. Julius Praglin. *Institute of Radio Engineers, Transactions on Instrumentation*, v. 1-6, June 1957, p. 144-147. (TK1 In6.6i Contin.)

Highly stable, low-cost instrument measures currents from 10^{-9} to 10^{-13} amps.

17648* Electroluminescence and Its Applications. J. N. Bowtell. *Institution of Electrical Engineers, Journal*, v. 3, Aug. 1957, p. 454-459.

The stimulation of luminescence by alternating electric fields. Applications and limitations of the phenomenon.

17649* Mechanical Strength of Power Transformers in Service. E. T. Norris. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Aug. 1957, p. 289-306.

Some of the strains are progressive and some of the stresses cumulative leading to short-term and long-term characteristics. Performance in service can be predetermined and the expectation of life in terms of number of short-circuits predicted for any given operating conditions.

17650* Insulation Engineering Fundamentals. XXI. Cleaning, Drying, and Renovating Insulation and Windings on Electric Equipment. Graham Lee Moses. *Insulation*, v. 3, Oct. 1957, p. 18-23.

17651 Distribution System Studies in Steel Mills. D. Dalasta and Frank Nolan. *Iron and Steel Engineer*, v. 34, Aug. 1957, p. 87-97.

Short circuit, load, and stability studies; motor starting problems; system grounding; modernization and expansion studies.

17652 Electric Drive Systems for Bar and Rod Mill Shears. A. J. White and J. A. Read. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 166-173.

17653* A Three Centimetre Microwave Bench for Studying the Pressure & Temperature Effects on Dielectric Behaviour of Gases. Krishnaji and G. P. Srivastava. *Journal of Scientific & Industrial Research*, v. 16, sec. A, July 1957, p. 289-294.

The gas cell is a 7-ft. rectangular waveguide bent in a suitable shape so that it can be put inside temperature controlled chambers. The minimum measurable value of the absorption coefficient is 0.5×10^{-6}/cm., and that of the electric susceptibility is 2×10^{-5}.

17654 Electrical Wiring Methods. J. W. Keller. *Machine Design*, v. 29, Oct. 3, 1957, p. 121-123.

Types of wiring, electrical characteristics, physical characteristics, application techniques.

17655* Basic Problems of Telephone Traffic Theory and the Influence of Repeated Calls. J. W. Cohen. *Philips Telecommunication Review*, v. 18, no. 2, Aug. 1957, p. 49-100.

Mathematical determination of the number of trunks necessary for efficient service.

17656* An Analysis of D-C Machine Commutation. J. R. M. Alger and D. T. Bewley. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 399-416.

An analytical method of determining bar-to-bar voltage as a function of time during commutation.

17657* Destructive Breakdown Tests on a Large Turbine-Generator Stator Winding. A. M. Nemetz, M. S. Kirwen, and J. S. Johnson. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 421-429.

17658* The Calculation of Radio and Corona Characteristics of Transmission-Line Conductors. C. J. Miller, Jr. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 461-475.

The concept of representing a bundled conductor by an "equivalent diameter" is confirmed.

17659* Digital Computation of Driving Point and Transfer Impedances. H. W. Hale and J. B. Ward. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 476-481.

17660* New 13.8-Kv 750-Mva Metal-Clad Switchgear With Magnetic-Type Power Circuit Breakers. J. G. Torbit and E. M. Troischt. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 540-548.

17661* Current Density and Temperature of High-Current Arcs. T. H. Lee, W. R. Wilson, and J. C. Sofianek. *Power Apparatus and Systems*, 1957, no. 31, Aug., p. 600-608.

17662* Stabilization of A. C. Supplies. O. E. Dzierzynski. *Wireless World*, v. 63, Oct. 1957, p. 491 + 5 pages.

A comparative review of methods of voltage control.

17663 The Measurement of Small Resistance Changes. Clifford C. McMahon. *Wire and Wire Products*, v. 32, Sept. 1957, p. 1005-1006.

Describes equipment used in the measurement of temperature coefficients of resistance of resistor alloys.

17664* (English.) **Charge and Discharge of a Non-Linear Condenser Through a Linear Non-Dissipative Inductance.** Asokendu Mozumder. *Zeitschrift für Angewandte Mathematik und Physik*, v. 8, no. 4, July 1957, p. 261-280.

17665* (Russian.) Rise of an Ultrahigh Frequency Pulse Discharge in Neon. **Vozniknovenie impul'snogo razriada v neone na sverkhvysokikh chastotakh.** V. E. Golant. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1482-1494.

On the basis of analytical approximation of the known experimental data concerning the probabilities of electron collision with Ne atoms, the distribution function of velocity of electrons is calculated.

17666* (Russian.) On the Method of Measurement and Registration of "Ultra Small" Currents. **O metodike izmereniia i registratsii "sverkhmalykh" tokov.** L. L. Dekabrun. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1578-1583.

Description of new measuring systems and equipment.

See also: **17257** (glass dielectrics); **17539** (determination of dielectric constants); **17600** (reliability of contacts); **17992** (couples for small electric motors); **18480** (resin insulation); **18481** (tests of epoxy casting resins); **18514** ("Zytel" wire insulation).

ELECTROCHEMISTRY

17667* Continuous Wire Plating Replaces Batch Process. *Automation*, v. 4, Oct. 1957, p. 67-68.

The 12 processing steps and their duration at a wire speed of 5 fpm.

17668 Hard Chromium Plating of Large Extruding Dies at Normal Temperature. M. E. Gol'dshtein. *Henry Brutcher Translation No.* 3988, 8 p. (From *Stanki i Instrument*, v. 28, no. 4, 1957, p. 34-35.) Henry Brutcher, Altadena, Calif.

Optimum composition of electrolyte is 250 g/liter of chromic anhydride and 4 g/liter (33.3 and 0.54 oz/gal.) of NH_4F. Plating temperature is 15-25 C and current density 8-12 amps./sq. dm.

17669 On the Mechanism of Electrolytic Rectification. Archibald W. Smith. *Canadian Journal of Physics*, v. 35, Sept. 1957, p. 1151-1155.

17670 (French.) Electrochemical Behavior of Technetium. Potential-pH Equilibrium Diagram of the System Tc-H_2O, at 25 C. **Comportement électrochimique du technétium. Diagramme d'équilibre tension-pH du système Tc-H_2O, à 25° C.** N. de Zoubov and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 50, May 1957, 12 p. (TA462 C33r Vis.)

17671 (French.) Electrochemical Behavior of Rhenium. Potential-pH Equilibrium Diagram of the System Re-H_2O, at 25 C. **Comportement electrochimique du rhénium. Diagramme d'équilibre tension-pH du système Re-H_2O, à 25° C.** N. de Zoubov and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 51, May 1957, 14 p. (TA462 C33r Vis.)

17672 (French.) Electrochemical Behavior of Tantalum. Potential-pH Equilibrium Diagram of the System Ta-H_2O, at 25 C. **Comportement électrochimique du tantale. Diagramme d'équilibre tension-pH du système Ta-H_2O, à 25° C.** J. Van Muylder and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 52, May 1957, 11 p. (TA462 C33r Vis.)

17673 (French.) Electrochemical Behavior of Niobium. Potential-pH Equilibrium Diagram of the System Nb-H_2O, at 25 C. **Comportement electrochimique du niobium. Diagramme d'équilibre tension-pH du système Nb-H_2O, à 25° C.** J. Van Muylder, N. de Zoubov, and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 53, June 1957, 11 p. (TA462 C33r Vis.)

17674 Anodic Processes. IV. The Anodic Generation of Calomel. H. P. Dibbs, D. J. G. Ives, and R. W. Pittman. *Chemical Society, Journal*, Aug. 1957, p. 3370-3377.

The initial stages of the anodic generation of calomel at the interface between Hg and dilute aqueous HCl were examined and the influence of acid concentration and temperature studied.

17675 Oxide Film Formation on the Surface of Metals in Aqueous Solutions and the Evaluation of Their Standard Potentials. V. The Tin Electrode. S. E. S. El Wakkad, T. M. Salem, and J. A. El Sayed. **VI. The Tungsten Electrode.** S. E. S. El Wakkad, T. M. Salem, H. A. Rizk, and J. G. Ebaid. *Chemical Society, Journal*, Aug. 1957, p. 3770-3779.

17676 Mechanisms of Hydrogen Producing Reactions on Palladium. IV. Electrochemical Kinetics of the α-Palladium-Hydrogen System in Acid Solutions. James P. Hoare and Sigmund Schuldiner. *Electrochemical Society, Journal*, v. 104, Sept. 1957, p. 564-568.

The pH effect on the anodic and cathodic polarization behavior was determined and related to bi-electrode mechanisms. Thickness of the bi-electrode had no significant effect. Catalytic activity for the H-producing reactions on α-Pd was definitely less than that on β-Pd. The fraction of the total current carried by proton flow was determined.

17677* Effect of Addition Agents on the Plating of Nickel. A. Goswami. *Journal of Scientific & Industrial Research*, v. 16, sec. B, July 1957, p. 315-317.

The effect of addition agents and brighteners on cathodic crystal growth in a Watt's type bath with a *p*H favorable to lateral growth was studied by electron diffraction. Addition agents producing a high cathode polarization result in outward growth deposits.

17678 Electroplating on Titanium Alloys. L. Missel. *Metal Finishing*, v. 55, Sept. 1957, p. 46-54.

Plating cycle; deposit evaluation; solution maintenance. Experimental data on 5% Cr-3% Al, 4% Mn-4% Al, and 6% Al-4% V, alloys.

17679 Thick Oxide Films on Aluminium Alloys. Preparation by Direct Current With Special Reference to Hard Anodizing. J. M. Kape. *Metal Industry*, v. 91, Sept. 13, 1957, p. 217 + 3 pages.

Abrasion resistance of various materials. Effect of coatings on fatigue strength, tensile strength, and corrosion resistance. Effect of heating the films. (To be concluded.)

17680* (Russian.) Galvanizing in Cyanide Electrolyte and Mechanical Properties of Steels. **Tsinkovanie v tsianistom elektrolite i mekhanicheskie svoistva stalei.** I. I. Moroz and N. T. Kudriavtsev. *Metallovedenie i Obrabotka Metallov*, 1957, no. 8, Aug., p. 28-33.

Investigation of the influence of chemical and electrochemical treatments during plating on the physicochemical properties of steels with different compositions. Plating in cyanide electrolyte affects the mechanical properties of high-strength steels more than high-ductility steels.

17681 The Testing and Examination of Electrodeposits. IV. Atmospheric Tests. R. Quarendon. *Product Finishing*, v. 10, Sept. 1957, p. 79-89.

Types of atmosphere; test panel arrangements; choice of test articles; accelerated tests; performance criteria; test duration; loss of weight; removing corrosion deposits; visual inspection.

17682* (Russian.) Periodic Phenomena in Electrodeposition of Metals. **Periodicheskie iavleniia pri elektroosazhdenii metallov. IV.** Effect of Anions on Periodic Phenomena During the Electrodeposition of Cadmium in the Presence of Surface-Active Substances. **Vliianie anionov na periodicheskie iavleniia pri elektroosazhdenii kadmiia v prisutstvii poverkhnostnoaktivnykh veshchestv.** D. N. Gritsan and D. S. Shun. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 437-442.

Study of the effect of various electrolytes and salt additions, having different anions.

17683* (Russian.) Protective-Decorative Chrome Plating of Aluminum Products. **Zashchitno-dekorativnoe khromiravanie aliuminievykh izdelii.** V. I. Lainer and Iu. A. Velichko. *Vestnik Mashinostroeniia*, v. 37, no. 9, Sept. 1957, p. 48-54.

Plating of aluminum products with various metals in order to obtain surfaces with certain properties. Methods of surface preparation. Enumeration of properties improved by Cr, Cu, Sn, and Ag electroplate.

17684 (Russian.) Corrosion Resistance of Galvanic Coatings Deposited on a Passivated Surface. **Korrozionnaia ustoichivost' gal'vanicheskikh pokrytii, nanesennykh na passivirovannuiu poverkhnost'.** L. I. Kadaner and A. Kh. Masik. *Zhurnal Prikladnoi Khimii*, v. 30, no. 7, July 1957, p. 998-1006.

Experimental proof that the passivation of iron increases the resistance to corrosion by both cathode and anode galvanic platings, creates a homogeneity of the surface to be plated, and decreases the porosity of the deposited coating.

17685* (Russian.) Causes of Local Spongy Formations on the Cathode in Fine Electrolytes. **K voprosu o prichinakh mestnykh gubchatykh obrazovanii na katode v tsinkatnykh elektrolitakh.** N. T. Kudriavtsev, R. Iu. Bek, and I. F. Kushevich. *Zhurnal Prikladnoi Khimii*, v. 30, no. 7, July 1957, p. 1093-1096.

Causes and the means of removal of the formations.

See also: **18095** (Al surface treatment); **18150** (properties of electroplate); **18167** (electropolishing of tungsten); **18523** (treatment of chromate wastes).

ELECTRONICS

17686 (English.) **Photoformer Analysis and Design.** Erik Elgeskog. *Acta Polytechnica (Electrical Engineering Series)*, v. 7, no. 3, 1956, 40 p. (T1 Ac81 Vis.)

It is possible to design a photoformer with an accuracy of 1-2% and a frequency range of several kc. The limiting factor in the system is the cathode-ray tube.

17687* (German.) Theoretical and Experimental Investigation of Distortion in Low-Frequency Tetrapolar Plane Transistors. **Theoretische und experimentelle Untersuchung der Verzerrungen in Niederfrequenz-Flächentransistor-Vierpolen.** Gelli A. Spescha and Max J. O. Strutt. *Archiv der Elektrischen Übertragung*, v. 11, Aug. 1957, p. 307-320.

17688* (German.) Transistor Noise in the Low Frequency Range. **Transistorrauschen im Niederfrequenzgebiet.** Johannes Schubert. *Archiv der Elektrischen Übertragung*, v. 11, Aug. 1957, p. 331-340.

Evidence validates a simple equivalent circuit in the region of white noise that indicates analogy to the noise of a vacuum triode.

17689 Low-Noise Transistor Microphone Amplifier. James J. Davidson. *Audio*, v. 41, Oct. 1957, p. 28 + 6 pages.

Discussion of the factors involved in developing a satisfactory microphone amplifier using transistors, with consideration of the effects of emitter current, source impedance, and volume-control placement to insure low distortion, low noise, and overall optimum performance.

17690 Basic Mathematics for Radio and Electronics. F. M. Colebrook and J. W. Head. 3rd Ed. 359 p. 1957. Philosophical Library, New York. (QA37 C67b3)

Deals with the basic principles of those branches of mathematics which are definitely necessary or specially useful, including Heaviside, calculus, linear differential equations, matrices, elementary statistics, and numerical computations.

17691* **Electronic Devices Employing Cathode-Ray Beams.** L. S. Allard. *British Communications & Electronics*, v. 4, Oct. 1957, p. 620-625.

The main types of tubes utilizing cathode-ray beams, and their particular applications.

17692* **Reliability Control of Electronic Equipment in Aircraft and Weapon Systems: General and Management Aspects.** C. I. Soucy. *Canadian Aeronautical Journal*, v. 3, Sept. 1957, p. 222-231.

17693 The Forward-Scattering of Radio Waves From Overdense Meteor Trials. C. O. Hines and P. A. Forsyth. *Canadian Journal of Physics*, v. 35, Sept. 1957, p. 1033-1041.

Results indicate that the same geometric factors enter this problem as enter the problem of forward-scattering from underdense trails.

17694 A Method for Interpreting the Dispersion Curves of Whistlers. L. R. O. Storev. *Canadian Journal of Physics*, v. 35, Sept. 1957, p. 1107-1122.

The first equation derived is treated as an integral equation determining the distribution of electron density along the path.

17695 The Cathode Ray Oscilloscope. J. Czech. 340 p. 1957. Interscience Publishers, New York. (TK7872.C27 C99etr)

Circuitry and practical applications.

17696* (French.) Determining the Frequency of a Transistor Multivibrator Between 4 and 4000 C/S. **Détermination de la fréquence d'un multivibrateur à transistor entre 4 et 4000 c/s.** Marcel Bichara. *Comptes Rendus*, v. 245, Aug. 26, 1957, p. 896-898.

The equation determining the frequency of a multivibrator having an unstable transistor was obtained. The results of the simplified equation were compared with those of experience.

17697 Triggering Electronic Flip-Flops From Mechanical Switches. Roland Yii. *Control Engineering*, v. 4, Oct. 1957, p. 71-73.

New transistor circuit converts multi-peak wave forms into a single pulse that prevents random triggering. Features of the transistor converter are 1-μ sec. rise-time and a reset characteristic adjustable to the switching cycle.

17698* (Russian.) The Special Distribution of Photoconductance by Single Crystals of CdS. **O forme spektral'nogo raspredeleniia fotoprovodimosti monokristallov CdS.** V. E. Lashkarev, E. A. Sal'kov, G. A. Fedorus, and M. K. Sheinkman. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1203-1205.

Study of the causes of photoconductance decrease in the short wave region of self absorption. Single CdS crystals were synthesized from Cd and S vapors.

17699* Effects of Nuclear Radiation on Electronic Components. R. D. Shelton. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 76-81.

Data on capacitors, resistors, and other components. Wide variation in effects was noted in components of same JAN type made by different manufacturers.

17700* Transistor-Magnetic Amplifiers. Niels Jasper, James C. Taylor, and William T. White. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 82 + 7 pages.

Optimum circuit design sometimes requires the peculiar characteristics of both transistor and magnetic amplifiers. Advantages and limitations of both are reviewed and seven combination circuits presented: three a.c. servo amplifiers; pulse-width modulated d.c. switch; d.c. to a.c. servo amplifier; a.c. to d.c. regulated power supply; low-level d.c. harmonic-type amplifier.

17701* Quantitative Criteria for Thermal Evaluation of Electronic Equipment. T. C. Reeves. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 108-112.

The most satisfactory criterion at present is the "thermal figure of merit". Thermal performance is interpreted in terms of its effect on circuit part reliability.

17702 Circuit Techniques Associated With Transistor Broadcast Receivers. I. J. N. Barry. *Electronic Engineering*, v. 29, Sept. 1957, p. 408-415.

Solution of circuit problems which arise due to use of transistors in radio receivers. (To be continued.)

17703 A Stabilized D.C. Power Supply Using Transistors. T. H. Brown and W. L. Stephenson. *Electronic Engineering*, v. 29, Sept. 1957, p. 425-428.

Design of a mains-operated d.c. stabilized power supply incorporating negative feedback to provide a low output resistance.

17704 A Low Voltage Stabilizer Employing Junction Transistors and a Silicon Junction Reference Diode. D. Aspinall. *Electronic Engineering*, v. 29, Sept. 1957, p. 450-454.

A Zener diode is used as a reference voltage source. Approximate equations for the output impedance and stabilizing factor of the circuit are obtained.

17705 VHF Propagation by Ionized Meteor Trails. I. W. R. Vincent, R. T. Wolfram, B. M. Sifford, W. E. Jaye, and A. M. Peterson. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 52 + 5 pages.

Summary of two years research provides basis for determining design parameters of a Meteor-Burst cummincations system.

17706 Design of Magnetic Circuits for Miniature Relays. Walter J. Richert. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 56 + 6 pages.

17707 Transistor Data for Logical Circuit Design. Richard B. Hurley. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 60 + 3 pages.

A discussion of the problem of determining characteristics truly and completely. Describes the electrical performance of transistors and what variations in these characteristics are important.

17708 Measuring Transistor "Power Gain" at High Frequencies. W. N. Coffey. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 66 + 5 pages.

Unique circuit measures directly the common emitter power gain of transistors in the 40-300 MC range when driven by a resistive generator.

17709 Progress Report on Semiconductor Rectifiers. Norman F. Bechtold. *Electronic Industries & Tele-Tech*, v. 16, Oct. 1957, p. 70 + 4 pages.

Silicon and Ge rectifiers are more desirable in high temperature areas while Se retains its superiority in high current uses.

17710* Low-Noise Stabilized D. C. Supplies Obtaining Very Low Hum and D. C. Drift. D. W. W. Rogers. *Electronic & Radio Engineer*, v. 34, Sept. 1957, p. 320-326.

States precautions necessary to eliminate forms of hum injection into power-unit feedback amplifiers. A three-valve stabilized supply is described.

17711 Miniaturization of Electronic Equipment. David A. Findlay. *Electronics*, v. 30, Oct. 1, 1957, p. 177-204.

Design; materials; cables and connectors; circuit magnetic, electromechanical, and panel components; power supplies; relays; tubes and transistors; production tools and techniques.

17712 Waveguide Loss Charts. A. F. Pomeroy. *Electronics*, v. 30, Oct. 1, 1957, p. 210 + 1 page.

Graphical presentation of attenuation values porvides data for typical commercial microwave equipment. When effective resistivity is known or estimated, attenuation in db/ft. can be determined at 1 to 75 kmc.

17713* (Russian.) Ring Recounting Circuits Using Transistors. **Kol'tsevye pereschetnye skhemy na poluprovodnikovykh triodakh.** V. A. Labuntsov and Iu. N. Plenkin. *Elektrichestvo*, 1957, no. 8, Aug., p. 48-53.

Description of two ring recounting circuits, one consisting of elementary trigger cells, the other comprising a common load resistance in the emitter circuit.

17714* (Russian.) Geometric Characteristics of Dispersion of Radio Waves in Turbulent Heterogeneities of the Troposphere. **Geometricheskie kharakteristiki rasseianiia radiovoln na turbulentnykh neodnorodnostiakh troposfery.** D. M. Vysokovskii. *Elektrosviaz'*, v. 11, no. 9, Sept. 1957, p. 12-19.

Mathematical analysis.

17715* (German.) Problems Concerning the Development of Today's Radio Receiver. **Probleme der heutigen Rundfunkempfänger-Entwicklung.** Werner Kausch. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, Aug. 1957, p. 329-330.

The number of frequency bands; recent improvements; progressive automation; further standardization of high- and intermediate-frequency parts.

17716 Some Observations of Antenna-Beam Distortion in Trans-Horizon Propagation. A. T. Waterman, Jr., N. H. Bryant, and R. E. Miller. *Institute of Radio Enigneers, Transactions on Antennas and Propagation*, v. AP-5, July 1957, p. 260-266. (TK1 In6.6ap Vis.)

Signals of 3000 mc. from a rotating narrow-beam transmitting antenna were observed at distances from 92 to 177 miles.

17717 Serrated Waveguide. I. Theory. Robert S. Elliott. **II. Experiment.** K. C. Kelly and R. S. Elliott. *Institute of Radio Engineers, Transactions of Antennas and Propagation*, v. AP-5, July 1957, p. 270-283. (TK1 In6.6ap Vis.)

17718 Mutual Impedance of Unequal Length Antennas in Echelon. Howard E. King. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-5, July 1957, p. 306-313. (TK1 In6.6 ap Vis.)

An expression is developed for the mutual impedance between two staggered parallel center-fed, infinitely-thin antennas of unequal lengths.

17719 Characteristics of Silicon Junction Diodes as Precision Voltage Reference Devices. Kurt Enslein. *Institute of Radio Engineers, Transactions on Instrumentation*, v. 1-6, June 1957, p. 105-118. (TK1 In6.6i Contin.)

Data on dynamic resistance, temperature coefficient, hysteresis, life, and noise are presented.

17720 Description and Operating Characteristics of the Platinotron—A New Microwave Tube Device. William C. Brown. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1209-1222.

The "platinotron" is a class of tubes which comprises a circular, but nonreentrant, dispersive network matched at both ends over the frequency region of interest, and a reentrant electron beam originating from a continuously or nearly continuously coated cathode coaxial to the network.

17721 The Role of Stratospheric Scattering in Radio Communication. H. G. Booker and W. E. Gordon. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1223-1227.

On the mixing-in-gradient hypothesis of incoherent scattering of radio waves in a dry atmosphere, the intensity of the irregularities in dielectric constant depends on the excess of the temperature gradient above that appropriate to an adiabatic atmosphere. In going from the upper troposphere to the stratosphere, there is a significant increase in this gradient excess and consequently a significant increase in the intensity of irregularities in dielectric constant.

17722 Carrier Generation and Recombination in *P-N* Junctions and *P-N* Junction Characteristics. Chih-Tang Sah, Robert N. Noyce, and William Shockley. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1228-1243.

For certain *p-n* junctions, it has been observed that the measured current-voltage characteristics deviate from the ideal case of the diffusion model. This paper shows that the current due to generation and recombination of carriers from generation-recombination centers in the space charge region of a *p-n* junction accounts for the observed characteristics.

17723 Synchronization of Oscillators by Periodically Interrupted Waves. Donald W. Fraser. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1256-1268.

Principles, methods, circuit applications, and the theoretical basis of the synchronization of LC oscillators by interrupted wave trains.

17724 Theory and Operation of Crystal Diodes as Mixers. G. C. Messenger and C. T. McCoy. *I.R.E., Proceedings*, v. 45, Sept. 1957, p. 1269-1283.

The electrical parameters (barrier resistance, barrier capacity, and spreading resistance) of a crystal diode are quantitatively related to its fundamental physical properties and geometrical construction. The effects of these parameters on conversion loss at U.H.F. and microwave frequencies are discussed, with particular reference to diodes made from *n*-type Ge and *p*-type Si.

17725 Design and Evaluation of an *S*-Band Rebatron. Irving Kaufman and Paul D. Coleman. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 936-944.

Design of accelerator for producing a high power, bunched, megavolt electron beam, theoretically possessing harmonic current frequencies in the submillimeter range.

17726 The Harmodotron—A Megavolt Electronics Millimeter Wave Generator. Murray D. Sirkis and Paul D. Coleman. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 944-950.

Theory; description; operation.

17727 Performance of Composite Peltier Junctions of Bi_2Te_3. Theodore S. Shilliday. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 1035-1042.

An experimental Peltier refrigerator utilizing thermoelements of annular configuration was designed, constructed, and operated. The device was operated under "no-load" conditions over a range of power inputs and exhibited a maximum ΔT of 49 C. Experimental performance confirmed theoretical predictions within experimental error.

17728* A Quantitative Theory of the Electro-Formation of Metal-Germanium Point Contacts. A. C. Sim. *Journal of Electronics and Control*, v. 3, Aug. 1957, p. 139-159.

A high source impedance is necessary for the attainment of highly reproducible results, and a uni-directional pulse having a particular minimum duration is optimum. Further control on the results of forming is achieved by adjustment of the transient conditions.

17729 The Space-Charge Limited Flow of Charged Particles in Planar, Cylindrical and Spherical Diodes at Relativistic Velocities. E. W. V. Acton. *Journal of Electronics and Control*, v. 3, Aug. 1957, p. 203-210.

Theoretical determinations of collector currents. In the planar case a general power series solution is obtained by direct integration; in the cylindrical and spherical cases, three ranges of accelerating voltage are considered.

17730* A Low-Frequency Amplifier With Fractional-Ohm Input Impedance. K. Landecker. *Journal of Electronics and Control*, v. 3, Aug. 1957, p. 218-224.

A method of amplification of d.c. and L.F. (several hundred cycles/sec.) potentials arising in sources of very low internal impedance. The essential element is a two-button carbon microphone which is excited by a sound wave of constant amplitude and which in series with the potential source takes the place of the interrupter in the well-known arrangements designed to amplify "chopped" d.c. potentials.

17731* A Millimicrosecond Pulse-Shaping Circuit. P. R. Orman and F. H. Wells. *Nuclear Instruments*, v. 1, July 1957, p. 183-185.

Circuit described which sharpens the output pulses from a secondary emission pulse generator to produce negative pulses of one millimicrosecond rise time and of seven volts amplitude at an output impedance of 70 ohms.

17732* (German.) Tests With a Large Rhombic Antenna at the Eschborn Transoceanic Radio Receiving Station. **Untersuchungen an der Grossrhombus-Antenne der Überseefunkempfangsstelle Eschborn.** W. Kronjäger, E. Mark, and K. Vogt. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, Aug. 1957, p. 382-384.

Shows actual advantages of large-scale antennas over normal-size rhombic antennas.

17733 Design Methods of Cooling Electronic Equipment. Alfred S. Gutman. *Machine Design*, v. 29, Sept. 19, 1957, p. 141-146.

Methods for obtaining effective heat transfer from electronic components to their environment.

17734 Radiation Effects and Electronic Devices. Henry H. Hausner and C. F. Johnson. *Military Electronics*, v. 3, Sept. 1957, p. 34-36.

Since operating circuits consist of simple elements, neutron and γ radiation effects upon them may be described to a substantial degree in terms of the effects on components.

17735 Components—Key to Reliability. Robert Lusser. *Military Electronics*, v. 3, Sept. 1957, p. 38 + 3 pages.

In order to fully determine guided missile reliability where components are concerned, engineers must understand basic principles.

17736* (Russian.) The Hall Effect in Aging Fe-Mo Alloys. **Ob effekte Kholla dispersionno-tverdeiushchikh splavov Fe-Mo.** A. V. Cheremushkina. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii*, v. 12, no. 2, 1957, p. 127-130.

Comparison of experimental results with known theoretical formulas for pure ferromagnetic metals and homogeneous solid solutions.

17737 (English.) **Analysis of the Photoconductance in Silicon.** L. J. van der Pauw. *Philips Research Reports*, v. 12, Aug, 1957, p. 364-376.

17738 Galvanomagnetic Theory for *n*-Type Germanium and Silicon: Hall Theory and General Behavior of Magnetoresistance. Louis Gold and Laura M. Roth. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 358-364.

17739 Photoelectromagnetic Effect in Indium Arsenide. Jack R. Dixon. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 374-378.

For *n*-type material it is found that the PEM short-circuit current is proportional to the magnetic induction for both high and low surface recombination velocities; *p*-type material is found to be nonlinear with respect to the magnetic induction; and the degree of nonlinearity depends on the surface recombination velocity.

17740 Photoconductivity and *Z* Bands in KCl and an Associated New Band. G. R. Cole and R. J. Friauf. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 387-391.

Measurements were made on colored KCl crystals, both pure and Sr doped. Assuming the room-temperature quantum efficiency for photoconductivity of the *F* center to be unity, the room-temperature quantum efficiencies of the Z_1 and Z_2 bands are found to be 0.3 ± 0.03 and 1.0 ± 0.2 respectively.

17741 Statistics of the Charge Distribution for a Localized Flaw in a Semiconductor. W. Shockley and J. T. Last. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 392-396.

A localized flaw such as a vacancy-interstitial pair, Au atom, or small void is considered. It is found that the charge situation can be described by a set of energy levels which are independent of the Fermi level but which are temperature-dependent.

17742 Distribution and Cross Sections of Fast States on Germanium Surfaces in Different Gaseous Ambients. A. Many and D. Gerlich. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 404-411.

Simultaneous measurements of surface recombination velocity and trapped charge density in the fast states as a function of surface potential are carried out on Ge surfaces at fixed gaseous ambients and temperatures.

17743 Frequency Dependence of the ac Resistance of Thin Semiconducting Films. Melvin Lax and Rainer Sachs. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 650-655.

17744 Galvanomagnetic Effects in *p*-Type Silicon. Donald Long. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 672-677.

The dependences of electrical resistivity and Hall effect on temperature and magnetic field strength were measured.

17745 Photoelectric Emission From Barium Oxide. Herbert R. Philipp. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 687-693.

Photoelectric emission measurements were made on sprayed coatings of BaO in several states of thermionic activity and at different temperatures. The yield from active cathodes shows a rise at a quantum energy of 3.8 e.v. ascribed to exciton-induced emission and another rise at 5 e.v. attributed to electrons ejected from the filled band. A magnetic velocity analyzer was used to determine the energy distribution of emitted electrons.

17746 Recombination in Plastically Deformed Germanium. G. K. Wertheim and G. L. Pearson. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 694-698.

Lifetimes in plastically deformed *n*- and *p*-type Ge were measured as a function of the amount of deformation and as a function of temperature. The dislocations have an electron capture radius of 3.4×10^{-5} cm. The lifetime in high-purity crystals containing 10^3 to 10^4 dislocations per sq. cm. may consequently be limited by recombination at dislocations.

17747 Recombination Centers and Fast States on Unstable Germanium Surfaces. Shyh Wang and George Wallis. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 947-953.

Measurements of surface conductance, photoconductance, dark field effect, and field effect under illumination were made on single crystals of *n*-type and *p*-type Ge. The density of the dominant recombination centers was found to change at the same rate as the density of the "fast" states near the center of the gap.

17748* (English.) **Impedance of Bulk Semiconductor in Junction Diode.** Toshio Misawa. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 882-890.

17749 On the Absorption by Free Carriers in Semiconductors. B. Donovan and N. H. March. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 883-885.

Study of infra-red absorption in n-type Ge.

17750 Molding Moves in on Printed Circuits. Norman L. Greenman. *Product Engineering*, v. 28, Sept. 30, 1957, p. 90-93.

Process offers mass-production economies with built-in wiring with heavier copper and other metal stocks that will carry larger currents.

17751* (Russian.) Calculation of the Propagation Constants in a Rectangular Waveguide Equipped With Ferrite Plates. **Raschet postoiannykh rasprostraneniia v priamougol'nom volnovode s ferritovymi plastinami.** A. V. Voronova and A. G. Gurevich. *Radiotekhnika i Elektronika*, v. 2, no. 4, Apr. 1957, p. 401-407.

Studies of single and double ferrite plates adjoining the thin walls of the wave guides. Use of computers for waveguide calculations.

17752* (Russian.) Fluctuations of the Amplification Coefficient of a Vacuum-Tube Amplifier. **Fliuktuatsii koeffitsienta usileniia lampovykh usilitelei.** A. N. Malakhov. *Radiotekhnika i Elektronika*, v. 2, no. 4, Apr. 1957, p. 438-449.

Origin of the fluctuations and connection with the variation in dimensions of the carbon resistors, the blinking effect of tubes, and the voltage fluctuation in different types of power supplies.

17753* (Russian.) On the Interaction of the Electronic Flow With the Field of Spatial Harmonics. **O vzaimodeistvii elektronnogo potoka s polem prostranstvennykh garmonik.** M. F. Stel'makh. *Radiotekhnika i Elektronika*, v. 2, no. 4, Apr. 1957, p. 470-483.

Calculating the propagation constants and determining expressions for amplification coefficients during the interaction of electron flow with a field of direct and reversed spatial harmonics of waves of the TM type.

17754* (Russian.) Effect of an Unhomogeneous Ionosphere Structure on Absorption of Radio Waves. **Vliianie neodnorodnoi struktury ionosfery na pogloshchenie radiovoln.** O. M. Ataev. *Radiotekhnika i Elektronika*, v. 2, no. 5, May 1957, p. 523-530.

Expressions are derived for the amplitudes of a signal many times reflected from the ionosphere, allowing for a heterogeneous structure.

17755* (Russian.) Long Symmetrical Waveguide Transition for the Wave H_{01}. **Dlinnyi simmetrichnyi volnovodnyi perekhod dlia volny H_{01}.** B. Z. Katsenelenbaum. *Radiotekhnika i Elektronika*, v. 2, no. 5, May 1957, p. 531-546.

Reflection of the wave H_{01} from a narrowing symmetrical transition. Phase of the reflected wave. Coefficient of reflection. Formation of parasite waves H_{0n}. Amplitude of direct and reversed waves.

17756* (Russian.) On the Operation of Electron Guns With Accumulation of Charges. **O rabote elektronno-luchevykh trubok s nakopleniem zariadov.** D. A. Novik. *Radiotekhnika i Elektronika*, v. 2, no. 5, May 1957, p. 642-652.

Representative diagrams of electron gun operation, based on the electric characteristics of the target. Formulas determining the potential relief and current of the signal. Structure of outgoing signals.

17757* (Russian.) Electron Waves in Slow-Wave Circuit Structures. Non-Linear Equations for Travelling-Wave Tubes. **Elektronnye volny v zamedliaiushchikh sistemakh. O nelineinykh uravneniiakh lbv.** L. A. Vainshtein. *Radiotekhnika i Elektronika*, v. 2, no. 6, June 1957, p. 688-695.

Mathematical analysis.

17758* (Russian.) Energy Distribution of Electrons Emitted From Sb-Cs Cathodes. **O raspredelenii energii elektronov iz sur'miano-tsezievykh katodov.** A. I. Piatnitskii. *Radiotekhnika i Elektronika*, v. 2, no. 6, June 1957, p. 714-725.

By the interchanged cathode method a measurement of the photoelectric current and of the secondary emission from the Sb-Cs cathode and Ag-Cs layer was made. These measurements detected the difference between the photoelectric currents of Sb-Cs cathode and Ag-Cs layer, and showed the presence of weak secondary electrons and their relation to the amount of Cs on the cathode.

17759* (Russian.) Performance Conditions of a Symmetrical Multivibrator. **O rezhimakh raboty simmetrichnogo mul'tivibratora.** N. A. Zheleztzov and M. I. Feigin. *Radiotekhnika i Elektronika*, v. 2, no. 6, June 1957, p. 751-761.

Approximate method of grading the multirange phase space into the subspaces of the separate motions of the symmetrical multivibrator. Spurious capacitance and grid current are taken into account. Presence of three performance conditions is proved. Autovibration period at positive grid bias is calculated.

17760* (Russian.) Radio-Wave Refraction Irregularities Caused by Large Discontinuities in the Ionosphere. **Nereguliarnosti refraktsii radiovoln i bol'shie neodnorodnosti v ionosfere.** V. V. Vitkevich and Iu. L. Kokurin. *Radiotekhnika i Elektronika*, v. 2, no. 7, July 1957, p. 826-832.

Measuring the vertical refraction of radio waves in the ionosphere. Changes in the refraction are caused by electronic irregularities in the F-layer.

17761* (Russian.) A Circular Waveguide Partially Filled With Ferrite as a Slow-Wave Circuit Structure. **Kruglyi volnovod, chastichno zapolnennyi ferritom, kak zamedliaiushchaia sistema.** R. G. Mirimanov and Iu. V. Anisimova. *Radiotekhnika i Elektronika*, v. 2, no. 7, July 1957, p. 843-855.

Maxwell's equations for a cylindrical waveguide, with longitudinal field threshold conditions. Distribution of the power flux across the wave guide.

17762* (Russian.) Electronic Conductance of a Space Charge Cloud in a Magnetron. **Elektronnaia provodimost' oblaka prostranstvennogo zariada v magnetrone.** V. P. Tychinskii. *Radiotekhnika i Elektronika*, v. 2, no. 7, July 1957, p. 912-924.

Calculation of the electronic conductance. Determination of natural functions of interaction space. Analysis of the electronic insertion conductance. Distribution of the field across the current.

17763 Method of Obtaining Pressure and Temperature Insensitive Microwave Cavity Resonators. C. M. Crain and C. E. Williams. *Review of Scientific Instruments*, v. 28, Aug. 1957, p. 620-623.

A method of fabricating cavity resonators having very low temperature frequency dependence and a means of building pressure insensitive cavity resonators. Fixed frequency resonators are obtained having stable temperature- and pressure-frequency characteristics.

17764* The Caesium Resonator as a Standard of Frequency and Time. L. Essen and J. V. L. Parry. *Royal Society of London, Philosophical Transactions*, v. 250, ser. A, no. 973, Aug. 8, 1957, p. 45-69.

Nature of resonance; description of the apparatus; experimental results; calibration of quartz clocks; frequency of the caesium resonance.

17765 On the Theory of the Thermal Capture of Electrons in Semi-Conductors. G. Rickayzen. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 480-494.

Considers the influence of the acoustic vibrations of the lattice on the capture of free carriers by impurities.

17766* (English.) **Electrical Properties of P-Type Indium-Antimonide.** Tadao Fukuroi and Chikako Yamanouchi. *Science Reports of the Research Institute, Tôhoku University*, ser. A, v. 9, Aug. 1957, p. 262-266.

17767* Rapid Automatic Checkout Equipment for Maintenance of Weapon Systems. David Y. Keim. *Sperry Engineering Review*, v. 10, July-Aug. 1957, p. 2-6.

Description of automatic equipment for rapid preflight or prelaunch tests.

17768* Component Developments. G. W. A. Dummer. *Wireless World*, v. 63, Oct. 1957, p. 482-485.

Trends in specifications for standardization of electronic components used by N.A.T.O. service units.

17769* Modern Thermionic Cathodes. R. W. Fane. *Wireless World*, v. 63, Oct. 1957, p. 488-490.

Review of the main types and their relative merits.

17770* (German.) The Behavior of Thermoelements During Intermittent Radiation as Affected by the Formation of Thermal Waves. **Das Verhalten von Thermoelementen bei intermittierender Bestrahlung unter dem Einfluss sich ausbildender Wärmewellen.** Rudolf Kessler. *Zeitschrift für Angewandte Physik*, v. 9, Aug. 1957, p. 408-412.

Six thermoelements of different constructions and under various air pressures were exposed to an intermittent radiation from 0 to 40 Hz. The decrease of the alternating voltage amplitude with changing frequency was studied.

17771* (Russian.) Galvanomagnetic Phenomena in the Presence of Strong Magnetic Fields in Semiconductors of the n-Ge Type. **Gal'vanomagnitnye iavleniia pri sil'nykh magnitnykh poliakh v poluprovodnikakh tipa n-Ge.** M. I. Klinger and P. I. Voroniuk. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 77-87.

The equilibrium electron concentration, Hall constant, and electrical resistance are considered.

17772* (Russian.) Decay Law for Concentration of Non-Equilibrium Charge Carriers in Semiconductors. **Zakon zatukhaniia kontsentratsii neravnovesnykh nositelei zariada v poluprovodnikakh.** G. M. Guro. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 158-165.

17773* (Russian.) Electron Density Fluctuations and Scattering of Radio Waves in the Ionosphere. **Fluktuatsii elektronnoi plotnosti i rasseianie radiovoln v ionosfere.** Ia. L. Al'pert. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 213-225.

17774* (Russian.) On the Origin of the Fluctuation of Crystal Triode Parameters. **K voprosu o prichinakh, vyzyvaiushchikh razbros parametrov kristallicheskikh triodov. I.** Triodes-Type *p-n-p*. **Triody *p-n-p* tipa.** A. P. Viatkin. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1197-1204.

Investigation of Ge wettability by In and study of relationship between depth of penetration of In into Ge and temperature, smelting period, and relative weight of In, which are origins of the fluctuation of crystal triode parameters. Data on the contour of p-n-transformation and diagrams for calculation of the width of the basic zone of *p-n-p* Ge triodes.

17775* (Russian.) Contribution to the Diffusion Theory of a Magnetron (Steady State). **K diffuzionnoi teorii magnetrona (staticheskii rezhim).** L. E. Pargamanik and M. Ia. Mints. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1301-1305.

Theoretical study of diffusion kinetics.

17776* (Russian.) Germanium Thermal Conversion Under Electronic Beam Irradiation. **Termicheskaia konversiia germaniia pri obluchenii elektronnym puchkom.** L. A. Balabanova and M. M. Bredov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1401-1407.

Thermal conversion of Ge caused by electron irradiation in a vacuum. Measuring the concentration of thermal acceptors and the life of unstable carriers in relation to irradiation time. Evaluation of the activation energy of thermal acceptors.

17777* (Russian.) Current Carrier Lifetime Measurements in Semiconductors. **Ob izmerenii vremeni zhizni nositelei zariada v polyprovodnikakh.** M. I. Iglitsyn, Iu. A. Kontsevoi, V. D. Kudin, and A. A. Meier. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1414-1424.

Theoretical and practical study of the method used in measuring the lifetime of charge carriers in semiconductors. Relation between carrier lifetimes and parameters of injected impulse.

17778* (Russian.) Current Carrier Lifetimes in Silicon Single Crystals. **Izmerenie vremeni zhizni v monokristallicheskom kremnii.** M. I. Iglitsyn, Iu. A. Kontsevoi, and V. D. Kudin. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1425-1430.

Measurements of the modulated conductivity in point contacts during the passing of currents. Relation between current carrier lifetime and temperature.

17779* (Russian.) Current-Voltage Characteristics of Powerful Semiconductor Rectifiers. **Vol'tampernye kharakteristiki moshchnykh polyprovodnikovykh vypriamitelei.** E. I. Rashba and A. I. Nosar'. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1431-1445.

Mathematical analysis.

See also: **17113** (aeronautical radio navigation); **17531** (dark conductivity of CdSe); **17553** (conductivity of PbS); **17564** (evaporation of oxide coated cathodes); **17662** (stabilization of a.c. cupply); **18157** (properties of InSb); **18443** (absorption of electromagnetic radiation in crystals); **18464** (theory of electrons in solids).

ENGINEERING ECONOMICS

17780 Atomic Energy in Industry, 5th Annual Conference. 262 p. 1957. National Industrial Conference Board, Inc., New York. (TK9006 N21a Vis.)

Prospects for economic nuclear power. Commercial power reactors. Radioisotopes in product development. Chemical processing and waste disposal. New markets for atomic age metals. Reactor hazards. Atomic energy legislation. Safety and health problems. The long range outlook for nuclear industries. Atomic energy developments abroad.

17781 A Survey of the Iron Ore Industry in Canada During 1956. T. H. Janes. *Canada, Department of Mines and Technical Surveys, Mineral Resources Information Circular* MR-22, May 1957, 83 p. (TN26 C16.55m Contin.)

Production development and markets; exploration activities; classification of iron ores; prices; tariffs; market and forecast of production for iron ores; reserves in Canada.

17782 A Survey of the Petroleum Industry in Canada During 1956. R. B. Toombs and R. A. Simpson. *Canada, Department of Mines and Technical Surveys, Mineral Resources Information Circular* MR-23, June 1957, 80 p. (TN26 C16.55m Contin.)

Exploration, development, and production of petroleum resources; transportation and storage; petroleum processing; marketing; industrial expenditures; world statistics.

17783 A Survey of the Natural Gas Industry in Canada During 1956. R. B. Toombs and R. A. Simpson. *Canada, Department of Mines and Technical Surveys, Mineral Resources Information Circular* MR-24, May 1957, 49 p. (TN26 C16.55m Contin.)

Year's record and appraisal of the closely related natural gas and petroleum industries. Industry, provincial government and federal government sources used in the preparation of the survey.

17784 A Survey of the Gold Mining Industry in Canada During 1956. Thomas W. Verity. *Canada, Department of Mines and Technical Surveys, Mineral Resources Information Circular* MR-25, May 1957, 55 p. (TN26 C16.55m Contin.)

Shows the condition of the Au mining industry for the yr. 1956 and gives statistical comparison with production in recent yrs.

17785* Saskatchewan—Off the Ground With a Boom. *Canadian Chemical Processing*, v. 41, Sept. 1957, p. 20-30.

A promising future appears as oil, potash, salt, pulpwood, lignite, and clays become available as raw materials.

17786 Petrochemicals. *Chemical Week*, v. 81, Sept. 28, 1957, p. 45-59.

Statistics on production and consumption; predictions for the future; costs; survey of products and producers.

17787* (Portuguese.) Iron Metallurgy and Iron Ore. **Siderurgia e minério de ferro.** Othon Henry Leonardos. *Engenharia, Mineracão e Metalurgia*, v. 26, no. 151, July 1957, p. 5-7.

Brief historical survey of Fe metallurgy. Production, import, and consumption of steel in Brazil from 1945 to 1956. Metallurgical centers and mineral resources. Export possibilities.

17788 The Caribbean—Mining's Newest Province. *Engineering and Mining Journal*, v. 158, Sept. 1957, p. 75-105.

An economic survey of this promising and active region.

17789 Screening and Appraising New-Product Ideas. Philip R. Marvin. *Machine Design*, v. 29, Sept. 5, 1957, p. 78-83.

The six steps involved in screening and appraising. Data necessary for realistic decisions are given along with information on how to collect, correlate, and use them.

17790 World Trade in Plastics. Erich Gansmuller and Robert W. Crawford. *Modern Plastics*, v. 35, Oct. 1957, p. 101 + 13 pages.

A survey of exports and imports throughout the world, with complete listings of raw materials plants.

17791 The Next Hundred Years. Man's Natural and Technological Resources. Harrison Brown, James Bonner, and John Weir. 193 p. 1957. Viking Press, New York. (T20 B81n)

Based on discussions with executives of 30 great American industrial organizations, this book explores the future of the earth's natural resources in relation to man and his technology, in terms both of raw materials and products, manpower, brainpower, and processes.

17792 Jet Age to Bring Revolution in Fuels. George Weber and John P. O'Donnell. *Oil and Gas Journal*, v. 55, Sept. 9, 1957, p. 51-54.

Biggest problem for the future is not the quantity of fuel but the kind.

17793 Manganese, Its Minerals, Deposits and Uses. John N. Hoffman. *Pennsylvania State University, Mineral Industries Experiment Station Circular No.* 49, 1957, 126 p. (TN21 P38c Contin.)

Survey of world sources, production, and consumption.

17794* Market Potential for Trade Sales Paint. J. R. Willner. *Paint and Varnish Production*, v. 47, Sept. 1957, p. 54 + 2 pages.

17795 The Western European Markets. J. Walter Thompson Co., compilers. 287 p. 1957. McGraw-Hill, New York. (HF3502 T37w Over.)

A descriptive and statistical survey of 21 markets made up of about 335 million people.

See also: **17273** (consumption of industrial fatty acids); **17864** (oil and gas field developments in U. S. and Canada).

FLUID MECHANICS

17796* Analysis of a Vector Field and Some Applications to Fluid Motion. W. J. Duncan. *Aeronautical Quarterly*, v. 8, Aug. 1957, p. 207-214.

17797* (German.) Flow of Plastic Bodies Through Tubes and Orifices Considering Clay as an Example. **Rohr- und Blendendurchfluss plastischer Körper am Beispiel von Ton.** H. J. Berghaus. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, Ausgabe B, no. 4, 1957, p. 135-148.

A new relation for the condition of wall adherence and a novel method of evaluation were derived. Method furnishes the slip velocity against the tube wall as well as the rheological flow behavior in the interior of the medium without introducing hypotheses.

17798 The Selection and Location of Flow Measurement Devices. W. F. Coxon. *Industrial Chemist*, v. 33, Sept. 1957, p. 441-445.

Principles of flow measurement; characteristics of various measuring devices, and their location in pipe systems.

17799 Non-Newtonian Fluid Flow. A. B. Metzner. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1429-1432.

Applicability of the generalized Reynolds number to Bingham plastic and power-law non-Newtonians is shown in detail.

17800 Inviscid Hypersonic Flow Over Blunt-Nosed Slender Bodies. Toshi Kubota. 18 p. 1957. California Institute of Technology, Pasadena. (TL573 K95i Over.)

A solution of the hypersonic small disturbance equations is obtained for non-lifting, symmetric blunt-nosed bodies by using the similarity property of the flow.

17801 Interaction of a Plane Shock and Oblique Plane Disturbances With Special Reference to Entropy Waves. Che-Tyan Chang. *Journal of the Aeronautical Sciences*, v. 24, Sept. 1957, p. 675-682.

At a given shock strength the amplitudes of the shock displacement and the downstream disturbances generated are plotted as functions of the orientation of the up-stream disturbance.

17802 A Direct Method for Calculating the Hydrodynamic Parameters of Explosives. C. J. Eekhoff. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 447-451.

A method is developed for calculating the velocity of detonation, velocity of flow of matter, temperature and pressure in the Chapman-Jouguet zone of a perfectly confined detonating explosive.

17803 Unsteady Flow of Gas Through a Semi-Infinite Porous Medium. R. E. Kidder. *Journal of Applied Mechanics*, v. 24, Sept. 1957, p. 329-332.

A perturbation method, carried out to include terms of the second order, is employed to obtain a solution of the nonlinear partial differential equation describing the flow of gas.

17804 Turbulence in Small Air Jets at Exit Velocities Up to 705 Feet per Second. L. W. Lassiter. *Journal of Applied Mechanics*, v. 24, Sept. 1957, p. 349-354.

17805* Hydraulic Circuit Design. *Mechanical World and Engineering Record*, v. 137, Sept. 1957, p. 396-397.

Basic calculations for smooth bore pipes with laminar or turbulent flow.

17806 Heat Transfer in Fully Developed Flow Between Parallel Plates With Variable Heat Sources. Albert L. Loeffler, Jr. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 547-566.

Nonuniform heat generation within the fluid causes a rise of the wall temperature with respect to the bulk temperature for both laminar and turbulent flow. A much greater percentage of the heat generated must be removed in the laminar case than in the turbulent case to attain a given wall temperature.

17807 Pipeline-Flow Efficiency Testing. III. R. F. Bukacek and R. T. Ellington. *Oil and Gas Journal*, v. 55, Sept. 30, 1957, p. 88-92.

Discusses errors which may occur in measuring various quantities and the effect each has on the final result.

17808 The Problem of Knudsen Flow. III. Solutions for One-Dimensional Systems. W. C. DeMarcus. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1302, pt. 3, Sept. 1957, 7 p. (UF767 Un3.1k Contin.)

17809 Stability of Laminar Boundary Layer Near a Stagnation Point Over an Impermeable Wall and a Wall Cooled by Normal Fluid Injection. Morris Morduchow, Richard G. Grape, and Richard P. Shaw. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4037, Aug. 1957, 56 p. (TL570 Un3t)

17810 Analysis of Shock Motion in Ducts During Disturbances in Downstream Pressure. Herbert G. Hurrell. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4090, Sept. 1957, 11 p. (TL570 Un3t)

Within a given frequency limit, shock position is related to small disturbances in downstream pressure by a first-order lag. The time constant and the gain of the lag are expressed in terms of a dimensionless time constant that depends only on the steady-state Mach number of the shock.

17811* The Magnetic Flow Meter for the Measurement of Liquid Flow. Russell H. Babcock. *Water & Sewage Works*, v. 104, Sept. 1957, p. 380-381.

Movement of conductive fluid generates e.m.f. which is proportional to speed of flow. Accuracy is ± 1%.

17812* (English.) **Slow Broad Side Motion of a Flat Plate in a Viscous Liquid.** Subhas Chandra Gupta. *Zeitschrift für Angewandte Mathematik und Physik*, v. 8, no. 4, July 1957, p. 257-261.

Problem is solved in terms of a function which turns out to be the electrostatic potential of the plate kept at a constant potential in vacuum. Method is applied to the case of a circular disc by introducing transforms and solving boundary value problem in electrostatics.

17813* (German.) Development of Formulas for the Velocity Potential of Linear Subsonic and Supersonic Flow Over Thick Bodies. **Reihenentwicklung des Geschwindigkeitspotentials der linearen Unter- und Überschallströmung für Körper nicht mehr kleiner Streckung.** Friedrich Keune. *Zeitschrift für Flugwissenschaften*, v. 5, Aug. 1957, p. 243-247.

17814* (Russian.) Effect of Convection on Diffusion. **O vliianii konvektsii na diffuziiu.** V. B. Fiks. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1282-1288.

Studies of diffusion in liquid flow in long pipes. The effect of convection in the liquid during transmission of dissolved substance results in diffusion intermixing along the axis of flow. The change in concentration of dissolved substance is described by a differential equation of convective diffusion. Limits in which this equation is accurate are shown.

See also: **17271** (flow in fluidized beds); **17859** (kinetic energy of turbulent motion); **17872** (flow of water in channels); **17895** (unsteady fluid flow).

FOOD TECHNOLOGY

17815 The Relationship of Pyridoxine and Riboflavin to the Nutritional Value of Polymerized Fats. L. A. Witting, T. Nishida, O. C. Johnson, and F. A. Kummerow. *American Oil Chemists' Society, Journal*, v. 34, Sept. 1957, p. 421-424.

17816 Comparison of Methods for Testing the Stability of Fats and Oils, and of Foods Containing Them. W. M. Gearhart, B. N. Stuckey, and J. J. Austin. *American Oil Chemists' Society, Journal*, v. 34, Sept. 1957, p. 427-430.

The conventional Active Oxygen method, the Schaal Oven method, and a new method based on a modification of the standard A.S.T.M. Oxygen Bomb method for gasolines are compared.

17817 Mobilities of Some Polyols, Sugars, Acids, and Other Compounds. Reactions on Paper With the Godin Reagent. M. G. Lambou. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1449-1451.

The solvent combination 1-propanol—ethyl acetate—water was used to determine carbohydrates qualitatively and quantitatively in deionized extracts from raw and dehydrated sweet potatoes.

17818 Electronic "Brains" for Food Firms? Charles E. French. *Food Engineering*, v. 29, Sept. 1957, p. 69-73.

Applicable to many complex management problems; for example, distribution, work-scheduling, and materials handling.

17819 Gaging the Boom in Rigid-Foil Packaging. John V. Ziemba. *Food Engineering*, v. 29, Sept. 1957, p. 80-83.

Reports on developments in Al containers.

17820 Roundup on Ultrasonics. Harold Rapp. *Food Engineering*, v. 29, Sept. 1957, p. 96-99.

Applications of ultrasonic waves in treatment of foods and beverages.

17821 Cure - and - Smoke Process Turns Out Improved-Quality Turkeys. H. R. Malcolm and J. G. Woodroof. *Food Engineering*, v. 29, Sept. 1957, p. 121-123.

17822* Freeze-Drying of Fruit. S. Jackson, Suzanne L. Rickter, and C. O. Chichester. *Food Technology*, v. 11, Sept. 1957, p. 468-470.

Peaches harvested at optimum maturity were torque-pitted, lye peeled, frozen, and lyophilized. The efficiency of heat transfer limited the drying rates, thus the maximum rates of drying were obtained by dielectric > infra-red > double plate > single plate heating, in that order. Dielectric heating seemed most promising for rapid lyophilization.

17823* Flavor and Odor Defects of Gamma-Irradiated Skim Milk. I. Preliminary Observations and the Role of Volatile Carbonyl Compounds. II. Identification of Volatile Components by Gas Chromatography and Mass Spectrometry. E. A. Day, D. A. Forss, and S. Patton. *Journal of Dairy Science*, v. 40, Aug. 1957, p. 922-941.

17824 The Use of Chlortetracycline (Aureomycin) to Retard the Spoilage of Poultry Carcasses. D. H. Shrimpton. *Journal of the Science of Food and Agriculture*, v. 8, Aug. 1957, p. 485-489.

No advantages are gained unless refrigerator transport and distribution is available.

17825 An Accelerated Storage Test for Dehydrated Vegetables. E. G. B. Gooding and R. B. Duckworth. *Journal of the Science of Food and Agriculture*, v. 8, Aug. 1957, p. 498-504.

Deterioration of culinary qualities occurring in a certain number of days at 55 C was approximately the same as that occurring in the same number of months at 37 C.

FUELS AND COMBUSTION

17826 The Chemistry of Humic Acids and a New Utilization of Lignite. Kozo Higuchi. 65 p. (TP325 H53c Over.)

A rapid method of qualitative analysis; conditions necessary for the extraction of humic acid from lignite. Evidence that humic acid consists of phenyl propane derivatives in its basic structural unit.

17827* Instrumentation and Industrial Gas. I. A. Linford. *Coke and Gas*, v. 19, Sept. 1957, p. 363-367.

Measurement and automatic control of industrial gas-burning appliances and equipment available for this purpose. (To be continued.)

17828* Behaviour of Inverted Propane-Hydrogen Sulphide Flames at the Blow-Off Limits. P. F. Kurz. *Combustion and Flame*, v. 1, Sept. 1957, p. 257-263.

At the lean limit propane appears to contribute its proportionate share to the stability of the mixed fuel, whereas the burning of H_2S is inhibited in the presence of propane. At rich blow-off, H_2S appears to inhibit the burning of propane in all mixtures, and when the fuel mixture contains more than 50 vol. percent H_2S the component fuels are mutually inhibiting.

17829* An Investigation of the Behaviour and Reaction Mechanisms of Nitric Acid-Hydrocarbon Flames. M. H. Boyer and P. E. Friebertshauser. *Combustion and Flame*, v. 1, Sept. 1957, p. 264-280.

Apparatus for producing HNO_3-supported bunsen flames. Data on the flame speed, flashback and blow-off limits, emission spectra, and analysis of the combustion products.

17830* Predicting the Laminar Flame Speed in Gases With Temperature-Explicit Reaction Rates. I. One-Dimensional Laminar Flame Theory for Temperature-Explicit Reaction Rates. II. D. B. Spalding. *Combustion and Flame*, v. 1, Sept. 1957, p. 287-307.

17831* Detonations in Gaseous Fuming Nitric Acid-Hydrocarbon Mixtures. D. H. Wayman and R. L. Potter. *Combustion and Flame*, v. 1, Sept. 1957, p. 321-329.

Detonation velocities in gaseous mixtures of fuming HNO_3 with *n*-heptane, methyl*cyclo*pentane, and toluene, were measured and their detonatable composition ranges determined. Detonation velocities and detonatability limits of fuming HNO_3-*n*-heptane mixtures diluted with up to 60 vol. percent N were also obtained.

17832* Temperature Stability of the Laminar Combustion Wave. J. F. Wehner and J. B. Rosen. *Combustion and Flame*, v. 1, Sept. 1957, p. 339-345.

The solution to a simplified form of the linearized time-dependent energy equation of a laminar flame is considered in order to develop a criterion for the stability of such a flame.

17833* Present Status of Information on Transport Properties Applicable to Combustion Research. A. A. Westenberg. *Combustion and Flame*, v. 1, Sept. 1957, p. 346-359.

A survey of available experimental and theoretical information on molecular diffusion and thermal conductivity coefficients likely to be of interest in low speed combustion studies. Emphasis is placed on high temperature data and practical methods of calculation.

17834 Solvent Extraction of Lignite and Carbonization of Lignite Extracts. N. W. Franke, E. I. Crowley, and H. J. Elder. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1402-1408.

Mild extraction-hydrogenation preceding carbonization points way to reducing cost of H used.

17835 Rate of Propagation of Propane-Air Flames Irradiated With a 10,000-Curie Gold Source. S. W. Churchill, Alexander Weir, Jr., R. L. Gealer, and R. J. Kelley. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1419-1422.

Beta radiation from a 10,000-curie Au source can increase the flame speed of low pressure propane-air Bunsen flames up to 50%.

17836* Oxidation Studies on Coals. I. The Crucible Swelling Test. B. H. Chalishazar and C. E. Spooner. *Institute of Fuel, Journal*, v. 30, Sept. 1957, p. 520-523.

Effects of oxidation and size reduction on the swelling properties of six bright coals.

17837* The Application of Oxygen Analysis to Combustion Control. J. C. Farquhar. *Instrument Engineer*, v. 2, Oct. 1957, p. 65-74.

Some general aspects of combustion; excess air and flue-gas CO_2; practical aspects of total-air control, using flue-gas measurements; proper utilization of total air; basic systems of automatic combustion control and application of the oxygen analyzer to them.

17838 A Type of Flame-Excited Oscillation in a Tube. J. J. Bailey. *Journal of Applied Mechanics*, v. 24, Sept. 1957, p. 333-339.

Describes two apparently new types of flame-excited oscillation in a tube, one occurring with cellular flames and the other with flat flames. A driving mechanism depending on varying flame speed is proposed for the latter case and a simple analysis of the driving and damping effects is made.

17839* Burning of a Liquid Droplet. III. Conductive Heat Transfer Within the Condensed Phase During Combustion. Henry Wise and C. M. Ablow. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 389-393.

During combustion the temperature in the center of the droplet may closely approach the surface temperature for liquid fuels commonly employed in propulsion. Such an increase may lead to thermal degradation and C formation observed during the combustion of certain organic compounds.

17840 High Pressure Jet Burners. New Technique Aids Localised Heating. *Metallurgia*, v. 56, Sept. 1957, p. 125-128.

In new type of burner, combustion is completed very rapidly in a refractory chamber or tunnel and the resultant gases, at a temperature of 1,750-1,850 C, are discharged from a narrow opening at the tunnel mouth at supersonic velocities.

17841 Vacuum Regenerating Units Prove Value in Dehydrating Natural Gas With Glycol. L. D. Polderman. *Oil and Gas Journal*, v. 55, Sept. 23, 1957, p. 107-112.

17842* (Czech.) Refining of Generator Gas by "Rectisol" Method. **Čištění tlakového plynu způsobem rectisol.** J. Jílek. *Paliva*, v. 37, no. 8, Aug. 1957, p. 261-263.

Basic principle and technological scheme of the "Rectisol" method. Selection of a solvent (such as methanol) substantially more effective than water, previously used for absorption of CO_2 from generator gas. Method is economical.

17843 Radiotracer Study Points Way to Make Clean-Burning Gasoline. L. B. Shore and K. F. Ockert. *SAE Journal*, v. 65, Sept. 1957, p. 18-21.

The deposit-forming tendency of hydrocarbons goes up strongly with increasing boiling point. The carbonaceous part of combustion-chamber deposits appears to form via a mechanism involving condensation followed by carbonization. Careful control of the high boiling end of the gasoline is needed to make a clean-burning fuel.

17844* (Russian.) Heat Exchange in an Air-Cooled Cyclone Combustion Chamber With Gas Exhaust Through the Top. **Teploobmen v tsiklonnoi kamere goreniia s vozdushnym okhlazhdeniem i verkhnim vyvodom gazov.** B. D. Katsnel'son and A. A. Shatil'. *Teploenergetika*, v. 4, no. 9, Sept. 1957, p. 73-75.

Theoretical and experimental study of heat exchange in a cyclone combustion chamber with air cooled walls. Brief description and design of combustion chamber with air cooling and gas exhaust through the top.

17845* (Russian.) Complex Utilization of Ukrainian Lignites. **Kompleksnoe ispol'zovanie burykh uglei v USSR. XIX.** Properties and Composition of Tars Obtained on Semicoking Lignite Under Pressure in Laboratory Conditions. **Svoistva i sostav smol, poluchennykh pri polukoksovanni burogo uglia pod davleniem v laboratornykh usloviiakh.** V. I. Kuznetsov and A. A. Bobrova. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 4, 1957, p. 550-555.

Study of physical properties and composition of resins obtained during the semicoking of lignites under 10, 20, 30 and 50 atm. pressure created by blowing with 100% nitrogen or 50% nitrogen and 50% water vapor.

17846 Experimental and Calculated Histories of Vaporizing Fuel Drops. R. J. Priem, et al. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3988, Aug. 1957, 66 p. (TL570 Un3t)

An experimental and theoretical investigation of the vaporization of fuel droplets in heated air under atmospheric pressure.

17847 Stability Limits and Burning Velocities for Some Laminar and Turbulent Propane and Hydrogen Flames at Reduced Pressure. Burton Fine. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4031, Aug. 1957, 49 p. (TL570 Un3t)

Effect of reduced pressure on blowoff, flashback, and burning velocities of propane-oxygen-nitrogen and hydrogen-air flames.

See also: **17556** (explosive reaction of acetylene and air); **17792** (jet age fuel problems).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

17848* Base-Level Control Patterns in Cyclothemic Sedimentation. Harry E. Wheeler and Haydn H. Murray. *American Association of Petroleum Geologists, Bulletin,* v. 41, Sept. 1957, p. 1985-2011.

Typical Pennsylvanian cyclothems manifest rapid, eustatic, base-level reversals superimposed on a simple tectonic environment of continuous slow subsidence.

17849* Potassium-Argon Dating of Igneous Rocks. J. F. Evernden, G. H. Curtis, and J. Lipson. *American Association of Petroleum Geologists, Bulletin,* v. 41, Sept. 1957, p. 2120-2127.

17850 The Crystal Structure of Uranophane $[Ca(H_3O)_2](UO_2)_2(SiO_4)_2 \cdot 3H_2O$. Deane K. Smith, Jr., John W. Gruner, and William N. Lipscomb. *American Mineralogist,* v. 42, Sept.-Oct. 1957, p. 594-618.

Structure consists of sheets parallel to (100) with the formula $[(UO_2)_2(SiO_4)_2]^{-4}$. Linking the sheets together are the Ca and water molecules. Seven oxygens surround the U, two of which form the linear uranyl ion with the U—O distance 1.91 Å.

17851 Synthesis, Stability and Polytypism of Nickel and Gallium Phlogopite. Cyrus Klingsberg and Rustum Roy. *American Mineralogist,* v. 42, Sept.-Oct. 1957, p. 629-634.

Phlogopites were synthesized with Ni^{2+} substituting for Mg^{2+} and Ga^{3+} for Al^{3+}. The Ni-phase was prepared only as the 3T polytype; the Ga-member could not be indexed on any simple basis. Their decomposition temperatures under hydrothermal conditions were determined and compared to that for phlogopite. The Ni substitution hardly affects the stability, whereas replacement by Al by Ga lowers the equilibrium dissociation temperature by 100 C.

17852* (English.) **Igy Instruction Manual. The Ionosphere I. Ionospheric Vertical Soundings. II. The Measurement of Ionospheric Absorption. III. The Measurement of Ionospheric Drifts. IV. Miscellaneous Radio Measurements.** *Annals of the International Geophysical Year,* v. 3, pts. 1-4, 1957, p. 1-381.

17853* Oil Flows in the Sahara. *Compressed Air Magazine,* v. 62, Sept. 1957, p. 262-265.

Maps out areas being investigated by the Seismic exploration method.

17854* The Beryllium-10 Concentration in Deep-Sea Sediments. P. S. Goel, et al. *Deep-Sea Research,* v. 4, 1957, p. 202-210.

The cosmic-ray-produced radioactive isotope, ^{10}Be (half-life 2.7 million years) was discovered in the upper and lower portions of a 15 m. long core from the sediment of the Pacific Ocean. A simple chemical procedure for its extraction was developed. Measurements indicate a sedimentation rate of about 5 mm/1,000 years.

17855 Drilling and Production Practice, 1956. 527 p. 1957. American Petroleum Institute, New York. (TN862 Am35d)

Papers deal with bits, drill stems, and casing; drilling fluids; fluid injection; surface and subsurface equipment; reservoir analysis; miscellaneous other topics.

17856* The Use of Leachable Uranium in Geochemical Prospecting on the Colorado Plateau. I. The Distribution of Leachable Uranium in Core Samples Adjacent to the Homestake Ore Body, Big Indian Wash, San Juan County, Utah. Heinrich D. Holland, Betty Ruth Curtiss, George E. McGill, and John A. Petersen. *Economic Geology,* v. 52, Aug. 1957, p. 546-569.

Concludes that leachable uranium analyses may serve as a useful tool in exploration for uranium ore.

17857 Orbital Behavior of Earth Satellites. I. Robert E. Roberson. *Franklin Institute, Journal,* v. 264, Sept. 1957, p. 181-202.

Reviews some of the more recent contributions, compiles the number of orbital results of value in satellite engineering, and discusses some of the perturbation sources on a satellite orbit. (To be continued.)

17858* Measurement of the Gyro-Frequency in the *F* Region. G. R. Ellis. *Journal of Atmospheric and Terrestrial Physics,* v. 11, no. 1, 1957, p. 54-58 + 1 plate.

At a mean true height of 378 km. the mean gyro-frequency was 1·53 Mc/s.

17859* Effects of the Scale of Spatial Averaging on the Kinetic Energies of Small-Scale Turbulent Motion. Warren A. Dryden. *Journal of Meteorology,* v. 14, Aug. 1957, p. 287-292.

The variations of the mean-motion kinetic energy and the eddy kinetic energy with scale of averaging are studied in a laboratory experiment of small-scale turbulence. Velocities and velocity products are spatially averaged for four different scales, and the energy terms are computed for each scale. It is found that, for increasing scale of averaging, there is a percentage decrease of mean-motion kinetic energy and a percentage increase of eddy kinetic energy.

17860* Hemispheric Numerical Forecasting With the Barotropic Model, and Some Remarks on Boundary-Condition Error. W. Lawrence Gates. *Journal of Meteorology,* v. 14, Aug. 1957, p. 332-342.

The results are summarized for a selected ten-day series of perdictions obtained over the northern hemisphere by conventional numerical methods with the barotropic model. The over-all accuracy of the forecasts is found to decay steadily with increasing forecast period up to 72 hrs. The errors remaining in the hemispheric integrations, are those due to the variation of the density of observational data (especially serious over the Pacific and Asiatic regions), those caused by excessive anticyclogenesis, those due to truncation error and the lack of smoothing, and those inherent in the model's neglect of baroclinic development.

17861* Comparative Studies of Relative Vorticities Computed From Geostrophic and Observed Winds. Roy E. Peterson. *Journal of Meteorology,* v. 14, Aug. 1957, p. 367-374.

Fixed networks of rawinsonde stations were used to compute geostrophic relative vorticity from reported heights and observed relative vorticity from components of reported winds at 500 mb. The geostrophic vorticity was computed on the two different scales of 600 and 300 km.; the observed vorticity was computed on a 600 km. scale. An analysis was made also of the vorticity variance produced by height errors, wind errors, and small-scale wind fluctuations.

17862 Miocene Fossils of Maryland. Bulletin 20. Harold E. Vokes. 85 p. 1957. State of Maryland, Board of Natural Resources, Department of Geology, Mines and Water Resources, Baltimore. (QE121 M366 Vis.)

A guide to the fauna of this region for non-scientific students and amateur collectors.

17863* Effects of Non-Primary Cosmic Radiation on the Number-Energy Relation and Geomagnetic Correlations Near the Top of the Atmosphere. K. A. Anderson. *Nuovo Cimento* (Supplemento), v. 5, ser. 10, no. 3, 1957, p. 389-416.

Experimental results at $\lambda = 10°$ and $\lambda = 55°$; character of the splash albedo; reliability of the slow protons and albedo flux values; mesons as a source of albedo particles.

17864 Oil and Gas Field Development in United States and Canada, 1956, by National Oil Scouts & Landmen's Association. T. H. Robinson and Jack L. Wiggins, editors.

v. XXVII. 1264 p. 1957. National Oil Scouts & Landmen's Assn., Austin. (TN862 N21o Vis.)

Annual review of geological and geophysical prospecting, land and leasing activities, wildcat exploration, proven field development, oil and gas production, pipe line and refinery statistics for 1956.

17865 How to Calculate Flowing B. H. P. of Gas Wells. John M. Campbell. *Oil and Gas Journal*, v. 55, Sept. 9, 1957, p. 114 + 1 page.

17866* The Oil Geology of Europe. J. C. M. Taylor. *Petroleum*, v. 20, Feb. 1957, p. 49-55.

Relates the main existing fields, and other regions which are suspected to have oil possibilities, to the geological history of the area.

17867 Factors Affecting the Galactic Diffusion of Cosmic Rays. Howard Laster. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1112-1118.

Effects of spatial and time inhomogeneities are studied.

17868 Time Variations of Extensive Air Showers. F. J. M. Farley and J. R. Storey. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 840-844.

Air showers corresponding to primary cosmic rays ranging from 10^{14} to 3 x 10^{15} ev. were recorded.

17869* (French.) Timbered Levels and the Mechanical Action of Rock. **Le soutènement en galeries et la mécanique des roches.** M. Coeuillet. *Revue de l'Industrie Minérale*, v. 39, Aug. 1957, p. 693-715.

Statics of mine roof and wall supports. Uniform stress of a circular continuous or discontinuous support. Movement of coherent semiplastic rock and earth.

17870 Stellar Spectrographs. I. Otto Struve. *Sky and Telescope*, v. 16, Sept. 1957, p. 536-539.

New interstellar elements and molecules were detected and individual clouds of interstellar material were recognized. Several gaseous components of planetary atmospheres were identified and magnetic fields discovered in many stars. (To be continued.)

17871 Principles of Geochemical Prospecting. H. E. Hawkes. *U. S. Department of Interior, Geological Survey Bulletin*, 1000-F, 1957, p. 225-355. (QE75 Un3b Vis.)

Methods of mineral exploration based on systematic measurement of the chemical properties of a naturally occurring material for the location of areas where the chemical pattern indicates the presence of ore in the vicinity.

17872* The Effect of Bed Profile on the Hydraulic Losses in Open Channels. W. Eastwood. *Water and Water Engineering*, v. 61, Aug. 1957, p. 334-337.

The resistance to the flow of water in natural channels can be considered to have three components. In addition to side friction, there will be losses caused by bends, and also by changes in the cross-sectional area of the channel.

17873* (German.) New Findings Concerning the Grinding Processes in Boreholes. **Neuere Erkenntnisse über die Zerkleinerungsvorgänge in Bohrlöchern.** Herbert Lück. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Aug. 1957, p. 391-396.

Three methods of investigation. Effects of impact energy and bite angle. Forms and dimensions of the percussion drill. Prospects.

See also: **17289** (petroleum production); **17693** (scattering of radio waves by meteor trails); **17705** (VHF wave propagation by meteor trails); **17714** (propagation of radio waves in troposphere); **17760** (refraction of radio waves by ionosphere); **17773** (ionospheric scattering of radio waves); **17793** (Mn minerals and deposits); **18415** (sound intensity in water); **18416** (underwater sound equipment); **18417** (underwater acoustics).

GRAPHIC ARTS

17874 The Zeta Potential of Silver Bromide in the Presence of Various Substances of Photographic Interest. James E. LuValle and Juanita M. Jackson. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1216-1222.

17875 Low-Temperature Reciprocity Failure of Photographic Emulsions and the Temperature Dependence of Sensitivity. G. C. Farnell. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 843-849.

Failure is only of the high-intensity type and is restricted to emulsion-developer combinations of relatively low sensitivity, in particular, to surface image development of nonchemically-sensitized emulsions. At −196 C, the effect is exhibited most readily by silver bromoiodide emulsions.

17876* Saving Steps in Your Lab With Copiers. *Paint and Varnish Production*, v. 47, Sept. 1957, p. 42-45.

Compares performance of several modern copying devices.

17877 The Nature and Formation of the Photographic Latent Image. J. W. Mitchell and N. F. Mott. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1149-1170.

A review of the theory in the light of recent advances in knowledge. Outlines the movements of ions and electrons most likely to occur during latent image formation.

17878* Biologically Safe Cobalt 60 Sensitometer. W. C. Brandsma, R. J. Panos, and T. T. Reboul. *Photographic Science and Engineering*, v. 1, July 1957, p. 9-11.

Device exposes photographic film to γ radiations from Co-60 and is used primarily for quality control testing of industrial X-ray film.

17879* Factors Affecting the Recognition of Small, Low-Contrast Photograhic Images. Robert S. Barrows. *Photographic Science and Engineering*, v. 1, July 1957, p. 15-22.

An analysis of information transfer by the photographic process in terms of the interpreter's ability to recognize objects by an examination of their photographic images.

17880* A Temperature-Compensating Device for Photographic Processing. D. J. Howe and J. A. C. Yule. *Photographic Science and Engineering*, v. 1, July 1957, p. 23-27.

A clock control circuit senses the developer temperature and varies the speed of an electric clock to compensate for changes in the rate of development.

17881* Run-of-Paper Color for Daily Newspapers. Vernon R. Spitaleri. *Printing Equipment Engineer*, v. 87, Sept. 1957, p. 45-47.

Future photography, engraving, color scanners, stereotyping, pressroom, direct printing, and offset.

17882* Properties and Processing of Presensitized Offset Printing Plates. IV. Questions About Plates Answered. Axel Lundbye. *Printing Equipment Engineer*, v. 87, Sept. 1957, p. 50 + 2 pages.

(To be continued.)

17883* On the Quality of Photographic Reproductions. A. Narath. *Research Council of Israel, Bulletin*, v. 5C, June 1957, p. 257-284.

Author proposes that details of sharpness are analogous to the related problem of details of brightness.

17884* On Some Properties of Photographic Layers for the Production of "Mikrats". H. Frieser. *Research Council of Israel, Bulletin*, v. 5C, June 1957, p. 285-288.

Discusses Goldberg's method for the production of extremely small photographic reductions.

17885 The Infrared Transparency of Magnetic Tracks. George Lewin. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Sept. 1957, p. 517-522.

By utilizing the PbS photoconductive cell, it is shown that excellent reproduction of an optical track can be achieved even though it is completely covered by a magnetic stripe.

17886 Automatic Printer Operation From Punched Tape and Punched Cards. H. M. Little and H. L. Baumbach. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Sept. 1957, p. 550-551.

Punched tape performs the functions of discrete scene-to-scene light changes, dissolve shutter operation, and automatic stopping of equipment.

HEAT POWER

17887 Liquid Rocket Propellants. Is There an Energy Limit? John F. Tormey. *Aeronautical Engineering Review*, v. 16, Oct. 1957, p. 54 + 5 pages.

Liquid rocket propellants are discussed from a chemical point of view, employing the specific impulse designation, a parameter determined by rocket combustion temperature and exhaust gas molecular weight.

17888* Gas Engine Heat Rejection to Evaporative Condenser. F. W. Adams. *Air Conditioning, Heating, and Ventilating*, v. 54, Sept. 1957, p. 93.

A piping hookup is suggested which will permit the use of an evaporative condenser to dissipate part of the heat from an engine connected to drive a compressor.

17889 The Hamilton Free-Piston Engine. *Automotive Industries*, v. 117, Sept. 15, 1957, p. 51.

A cutaway sectional view is presented.

17890 Details of the Marvel-Schebler Fuel Injection System. *Automotive Industries*, v. 117, Sept. 15, 1957, p. 52 + 2 pages.

17891* Diesel Propulsion Plants for Naval Vessels. James J. Turner. *Bureau of Ships Journal*, v. 6, Oct. 1957, p. 15-19.

Procedure for selection of the optimum propulsion plant for a given ship.

17892* (Russian.) Vibrating Reliability of Rotary Blades of Steam Turbines. **O vibratsionnoi nadezhnosti rabochikh lopatok parovykh turbin.** I. Z. Tsyrkin. *Elektricheskie Stantsii*, v. 28, no. 8, Aug. 1957, p. 12-13.

Reliability of blades largely depends on their proper adjustment. This eliminates many breakdowns due to tangential resonance vibrations.

17893* (Russian.) Experimental Investigation of Temperature Regions at Critical Points in an Experimental Model of CBK-150-1 Turbine. **Eksperimental'noe issledovanie temperaturnykh polei v osnovnykh uzlakh golovnogo obraztsa turbiny CBK-150-1.** A. P. Drozdov. *Energomashinostroenie*, v. 3, no. 8, Aug. 1957, p. 5-11.

Approximate calculation of thermal stresses in turbine parts under various thermal and operating conditions. Some suggestions for quicker starting of the turbine.

17894* Radial Flow Machinery. *Engineer*, v. 204, Aug. 30, 1957, p. 296-297.

Two new examples of gas turbine technology feature radial flow components, in one case because of the practical advantages in a small turbine, and in the other because of the need for an easily matched characteristic on a single-shaft mechanical-drive engine.

17895* (German.) Contribution to the Calculation of Unsteady Fluid Flows With Special Regard to the Charging Processes in Internal Combustion Engines. **Beitrag zur Berechnung von Strömungsvorgängen, insbesondere von Ladungswechselvorgängen an Verbrennungskraftmaschinen unter Berücksichtigung der instationären Strömung.** Eugen Wilhelm Huber. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, *Ausgabe B, VDI-Forschungsheft* 462, 1957, 32 p.

A new theoretical method is developed for the calculation of charging processes in reciprocating engines taking account of the mass effect due to accelerations and declerations of the flow. Working diagrams permit an easy graphical determination of the variation with time of the flow velocity in the control mechanism and, therefrom, to obtain the law of charging.

17896* Design and Characteristics of a Combined Gas and Steam Cycle of 40,000 KW Capacity. A. R. LeBailly and L. Skog, Jr. *Heat Engineering*, v. 32, July-Aug. 1957, p. 58-64.

A combination of gas and steam turbines is 7.4% more efficient than conventional steam equipment.

17897 Jet Aircraft Power Systems. Jack V. Casamassa and Ralph D. Bent. 2nd Ed. 329 p. 1957. McGraw-Hill, New York. (TL709 C26j2)

The history, theory, construction, and operation of jet propulsion, rockets, rocket systems, ramjets, pulsejets, and gas-turbine engines.

17898 1957 Liquid Propellant Round-Up. *Missiles and Rockets*, v. 2, Sept. 1957, p. 82-86.

Data on engines, companies, and fuels.

17899 Natural Circulation Steam Generators for Nuclear Power Plants. J. C. Westmoreland. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 533-546.

Analysis of generators was made to facilitate the prediction of certain dynamic characteristics of the systems in terms of their pertinent geometric parameters.

17900 A New Concept in the Design of Jet Engine Mufflers and Test Cells. E. J. Richards and D. J. Evans. *Royal Aeronautical Society, Journal*, v. 61, Sept. 1957, p. 619-630.

A relatively small spreader can be added behind a jet nozzle which changes the shape of the jet from circular to a long annular slot. The frequency rise thus obtained is used to reduce L.F. noise, possibly at the expense of more easily attenuated H.F. noise.

17901 A Symposium on Internal Combustion Engine Valves. 216 p. 1957. Thompson Products, Inc., Cleveland. (TJ774 T37s Over.)

A collection of reprints of important technical papers on metallurgy, types, and operating factors.

17902* (Russian.) On the Factors Determining the Service Life of Gas Turbine Blades. **K voprosu o faktakh, opredeliaiushchikh srok sluzhby lopatok gazovykh turbin.** V. A. Parfenov. *Teploenergetika*, v. 4, no. 9, Sept. 1957, p. 19-22.

Determination of service life of thermally-strained gas-turbine blades; deterioration of safety factor of the blades vs. time. It is shown that weakening and recrystallization of a distorted surface layer reduces the duration of reliable use of the blades.

17903 Aerodynamic Forces on a Vibrating Unstaggered Cascade. H. Söhngen. *U. S. National Advisory Committee for Aeronautics, Technical Memorandum* 1412, Aug. 1957, 16 p. (TL570 Un3tm)

The unsteady aerodynamic forces, based on two-dimensional incompressible flow considerations, are determined for an unstaggered cascade, the blades of which are assumed to vibrate in phase with one another in an approach flow parallel to the blades.

See also: **17123** (liquid rocket engine control); **17996** (design of pistons and piston rings); **18132** (stresses in engine parts); **18465** (thermal capacity of water-steam mixtures).

INFORMATION—PREPARATION AND DISSEMINATION

17904 A Guide to the Literature of Chemistry. E. J. Crane, Austin M. Patterson, and Eleanor B. Marr. 2nd Ed. 397 p. 1957. John Wiley & Sons, New York. (Z5521 C85g2)

To keep pace with the rapid recent growth of literature, various kinds of sources of chemical information are analyzed. Serves as a guide to books, periodicals, patents, government publications, trade literature, indexes, and libraries, in relation to literature searches.

17905 Information Indexing and Subject Cataloguing. Alphabetical: Classified. Coordinate: Mechanical. John Metcalfe. 338 p. 1957. Scarecrow Press, New York. (Z696 M56i)

Description and critical comparison of various methods of information indexing, book and document cataloguing, and classifying.

17906 The Measurement of Meaning. Charles E. Osgood, George J. Suci, and Percy H. Tannenbaum. 342 p. 1957. University of Illinois Press, Urbana. (BF455 Os3m)

A procedure called the "semantic differential" is used to measure meaning. Possible applications include the measurement of attitude and attitude change; assessment of personality and the effects of psychotherapy; study of similarities and differences in meanings across cultures and languages; measurement of the effetcs of messages both in aesthetics and in mass communication.

17907 Scientific and Technical Translating and Other Aspects of the Language Problem. 282 p. 1957. Unesco, Paris. (PN241 Un2s)

INSTRUMENTATION

17908* A Nomograph for Calculating Color Differences Using the Adams-Nickerson Equation. Douglas P. Adams, Roland E. Derby, Jr., Roxy E. Ernsberger, and Richard B. Solo. *American Dyestuff Reporter*, v. 46, Sept. 9, 1957, p. 649-654.

17909 Quantitative Determination of Porosity by X-Ray Absorption. G. L. Clark and C. H. Liu. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1539-1541.

The X-ray absorption method for measurement and control of porosity, which involves penetration through specimens with no discrimination between open and closed pores, was critically compared with the pycnometric method in tests with commercial rubber-composition storage battery separators. Measurements by both methods were in satisfactory agreement. For the X-ray method, after the linear absorption coefficient is once determined for the complex mixture, each specimen can be non-destructively tested in a few minutes. The X-ray method is reliable as well as speedier and simpler than pycnometer density measurements. It also permits a rapid test of uniformity of porosity.

17910 Determination of Particle Size of Powders With a Gelatin Solution. A. S. Serenko and A. V. Shidnik. *Henry Brutcher Translation No.* 3987, 5 p. (From *Zavodskaia Laboratoriia*, v. 22, no. 10, 1956, p. 1204-1205.) Henry Brutcher, Altadena, Calif.

Method of preparing powders for determination of particle size under the microscope. Results obtained with different powders such as coal, iron ore, quartzite, cement, and chamotte.

17911 (English, French, and German.) **Electron Microscopy. Proceedings of the Stockholm Conference, September 1956.** F. S. Sjöstrand and J. Rhodin, editors. 355 p. 1957. Academic Press, New York. (QH211 EL25)

A compilation of papers on instrumentation, techniques, and specific applications of electron microscopy.

17912 Trends in Acceleration Measurement. Anthony W. Orlacchio and George Hieber. *Institute of Radio Engineers, Transactions on Instrumentation*, v. 1-6, June 1957, p. 93-98. (TK1 In6.6i Contin.)

Units described cover acceleration ranges from 0.001 g to 25,000 g, frequency responses from up to 20,000 c.p.s., and temperature ranges from −65 up to +500 F.

17913 High-Frequency, High-G Calibration. E. I. Feder and A. M. Gillen. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 98-104. (TK1 In6.6i Contin.)

Calibration systems for piezoelectric accelerometers operating at 20,000 c.p.s. and 15,000 g.

17914 The Principles and Application of Radioisotopes to Noncontact Measurements for Continuous Processes. O. Bauschinger, Y. M. Chen, and F. H. London. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 122-127. (TK1 In6.6i Contin.)

Description and operation of radiation gages of various types.

17915 Use of the Compensated Hot Thermopile Principle in Industrial Instrumentation. Charles E. Hastings and Raymond T. Doyle. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 131-139. (TK1 In6.6i Contin.)

Describes the basic circuit and principle of operation of the compensated hot thermopile principle and the utilization of this circuit in anemometers, vacuum gages, flowmeters, differential pressure indicators, and thermal conductivity gages.

17916 Use of High Frequency Ultrasound for Determining the Elastic Moduli of Small Specimens. H. J. McSkimin. *Institute of Radio Engineers, Transactions on Ultrasonics Engineering*, PGUE-5, Aug. 1957, p. 25-43. (TK1 In6.6u Vis.)

For specimens having linear dimensions of the order of 2 or 3 mm., a phase comparison technique proved successful.

17917 Precision Calibration of Ultrasonic Fields by Thermoelectric Probes. Floyd Dunn and William J. Fry. *Institute of Radio Engineers, Transactions on Ultrasonics Engineering*, PGUE-5, Aug. 1957, p. 59-65. (TK1 In6.6u Vis.)

Transient type, thermoelectric probe yields information concerning the pressure amplitude, particle velocity amplitude, and intensity of the ultrasonic field in which it is placed.

17918* Primary Elements for Temperature Measurement. H. G. Oughton. *Instrument Engineer*, v. 2, Oct. 1957, p. 76-82.

Principles, construction, and performance features of resistance-thermometer elements, thermocouples, and radiation pyrometers, with special reference to applicational technique.

17919 Temperature Regulators. C. S. Beard. *Instruments and Automation*, v. 30, Aug. 1957, p. 1479-1483.

Thermal systems; vapor pressure; liquid and mercury expansion; gas-filled systems; differential expansion of metallic elements; regulator selection; pilot operation; combined pressure-temperature control; special valves.

17920 High-Speed High-Pressure Gage. P. L. Edwards. *Instruments and Automation*, v. 30, Aug. 1957, p. 1504-1506.

Design of gage described; used to determine pressure-volume-temperature relationships of some gases at high temperatures and pressures up to 4000 K and 100,000 psi.

17921 Accuracy of Thermocouples in Parallel. Paul W. Kilpatrick. *Instruments and Automation*, v. 30, Sept. 1957, p. 1706-1709.

Parallel-connected thermocouples can measure average temperature to ± 0.1%.

17922 Applications of the Recording Potentiometer. George A. Rutledge. *Instruments and Automation*, v. 30, Sept. 1957, p. 1730-1733.

Described as a basic tool for measuring and recording variables such as temperature, pressure, and strain.

17923 Control of Atmosphere Generators. R. R. Swain. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 152-159.

Methods of measurement and analysis; sampling methods; control systems.

17924 Method for the Measurement of Transparency of Sheet Materials. Alfred C. Webber. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 785-789.

A method for measurement of specular transmittance at essentially 0° angle to the incident beam.

17925 Design of a Compact Wide Aperture Fizeau Interferometer. P. R. Yoder, Jr. and W. W. Hollis. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 858-861.

An $f/3$ lens system consisting of two plano convex lenses can be used in an interferometer of 10-in. aperture with the plates separated as much as 0.050-in. The instrumental error introduced into the fringe pattern is no greater than $\lambda/100$ for Hg green light.

17926 (German.) Surface Examination of Solid Bodies With the Electron Emission Microscope. **Oberflächenuntersuchungen fester Körper durch Elektronenemissionsmikroskopie.** E. B. Bas. *Planseeberichte für Pulvermetallurgie*, v. 5, no. 2, Aug. 1957, p. 42-52.

Principle of the thermionic emisison microscope. The contrast in the electron image explained by the electrons emitted. General applications, especially as regards the surface reactions in metals. Molybdenum carburization phenomena.

17927 (English, French, and German.) **The Proceedings of the Third International Conference on Electron Microscopy, London 1954.** 705 p. 1956. Royal Microscopical Society, London. (QH211 In8p)

These 158 papers cover electron optics, specimen preparation, instrumentation, and specific applications.

17928 Pressure Sensitive Material Measures Explosion Forces or Footfall of a Fly. Dudley B. Clark. *Product Engineering*, v. 28, Sept. 1957, p. 106-109.

Pressure cells made from rare earths change electrical resistance when compressed, serve as force transducers to operate relays without amplification.

17929 Indium Resistance Thermometer; 4 to 300 K. G. K. White and S. B. Woods. *Review of Scientific Instruments*, v. 28, Aug. 1957, p. 638-641.

A resistance thermometer made with a metallic element of low Debye characteristic temperature and very high purity.

17930* (Russian.) Method of Measuring the Specific Surface of Mineral Powders. **K metodike izmereniia udel'noi poverkhnosti poroshkov mineralov.** I. N. Plaksin, A. M. Okolovich, and L. P. Zaraiskaia. *Tsvetnye Metally*, v. 30, no. 8, Aug. 1957, p. 37-43.

Method, based on vacuum drawing of air through the powder, permits determination of the total outside surface of the particles and the inside surface of pores and cracks. The chemical nature of the substance does not affect the measurement. Results agree with those of other methods.

17931* (German.) Principles in Developing Industrial Radiation Gages. **Gesichtspunkte bei der Entwicklung von industriellen Strahlungsmessgeräten.** Gerhard Röbert. *VDI Zeitschrift*, v. 99, Aug. 1957, p. 1173-1174.

Requirements for the design of instruments using radioisotopes. Time constant as a measure of the operating time. Beta-ray thickness meter.

17932* (Russian.) Improvement of the Method of Specific Surface Measurement of Carbon Black. **Usovershenstvovaniia v metodike izmereniia udel'noi poverkhnosti sazhi.** I. N. Duzhanskii. *Zavodskaia Laboratoriia*, v. 23, no .8, Aug. 1957, p. 948.

See also: **17188** (infrared detector); **18141** (temperature standards); **18266** (electronic micrometers).

LUBRICATION AND FRICTION

17933 Performance Assessment of Oils. A New Reflex Rating Technique. T. G. Bold and P. W. Harrison. *Automobile Engineer*, v. 47, Set. 1957, p. 366-369.

Method of rating lubricating oils according to carbon and lacquer deposits on pistons.

17934* (Russian.) Reasons for Changing Oil Quality in Engines. **O prichinakh izmeneniia kachestva masla v dvigatele.** A. V. Serov. *Avtomobil'naia i Traktornaia Promyshlennost'*, 1957, no. 7, July, p. 19-21.

Formation of precipitates in engines can be reduced by improving the quality of oils, mainly by use of various mixtures. Gives data on the effect of the air-fuel mixture on the formation of carbon deposits, and on the loss of mobility of piston rings.

17935 Gelling Agent for Heat- and Shear-Resistant Greases. *Chemical Processing*, v. 20, Oct. 1957, p. 97-99.

Superior multipurpose and specialized grease lubricants for indusrial, automotive, marine, and aircraft applications can be made by using gelling agent GA-10, a derivative of terephthalic acid.

17936* (Russian.) Friction as Resistance to Shear of Thin Surface Layers of Solids. **Trenie kak soprotivlenie sdvigu tonkikh poverkhnostnykh sloev tverdykh tel.** G. I. Edifanov. *Daklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 764-767.

Study of friction of pure metal surfaces.

17937 The Electron Microscope in the Study of Wear. D. Scott and H. M. Scott. Paper from "Electron Microscopy. Proceedings of the Stockholm Conference, September 1956". Academic Press. 1957. p. 331-333. (QH211 EL25)

Micrographs show that the electron microscope can, with the use of a formvar replica technique, reveal small scale features of interest in the study of wear and can yield experimental evidence for postulated theories of the mechanism of wear.

17938 Preparation of Lubricating Oil Additives From Dimercaptothiadiazole. Ellis K. Fields. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1361-1364.

In addition to inhibiting corrosion of Cu-Pb bearings, most dimercaptothiadiazole derivatives prevent corrosion of Ag by active S compounds.

17939 Standards and Classification of Lubricants for Steel Mills. J. D. Lykins. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 101-104.

Standardization of lubricants and lubricant equipment has resulted in cost savings, reduced storage space, reduced deterioration of stock, and simplified training of the men.

17940 Silicone Lubricants for the Steel Industry. W. H. Ragborg and W. H. Badger. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 105-108.

Chief uses are in applications where high heat stability is required, where changes in viscosity must be kept at a minimum through a temperature range, and where chemical inertness and chemical incompatibility are needed.

17941 Frictional Heating and Its Influence on the Wear of Steel. N. C. Welsh. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 960-968.

High frictional temperatures during the dry or imperfectly lubricated rubbing of steel produce gross structural changes and intense hardening of the surface layers. In consequence of these changes the wear time curve shows a marked inflexion, the wear rate of soft steel on soft steel diminishing by more than an order of magnitude as the hardened skin develops. The protective layer establishes itself more readily as the carbon content of the steel increases, a feature explained by the ease with which eutectoid pearlite transforms to austenite, and thence to martensite, during the rapid temperature cycle. By simulating the hot spots during wear by the thermal action of electric sparks, the hardness change is shown to be intensified by N or C absorbed from the atmosphere or lubricant.

17942* **Lubrication of Portable Air Tools.** *Lubrication*, v. 43, Sept. 1957, p. 105-112.

Types of pneumatic tools and their lubrication requirements. General lubrication and care of air tools. Conditioning the air.

17943* **Synthetic Ester Lubricants.** R. S. Barnes and M. Z. Fainman. *Lubrication Engineering*, v. 43, Aug. 1957, p. 454-458.

Synthetic esters have properties that make them good lubricants under conditions too severe for mineral oils. Lubricants with particularly good properties can be made from polyhydric alcohols and monobasic acids. Alcohols derived from neopentane have no H atoms on the β-C atom and give esters of improved thermal stability. Straight-chain monobasic acids give good lubricity.

17944* **Numerical Solution of Reynolds' Equation for Sector Thrust Bearings.** B. Sternlicht and H. J. Sneck. *Lubrication Engineering*, v. 43, Aug. 1957, p. 459-463.

17945* **Internal Load Reactions in Rolling Bearings.** R. K. Allan. *Mechanical World and Engineering Record*, v. 137, Sept. 1957, p. 390-395.

Mathematical analysis.

17946 Friction and Wear. *Metal Industry*, v. 91, Sept. 13, 1957, p. 216.

Influence of temperature; load-wear relationships.

17947 How to Reduce Shock Loads in Bearings. R. H. Carter. *Product Engineering*, v. 28, Sept. 1957, p. 72-76.

Equations and tables for estimating shock capacity of bearings; special races, springs, and resilient materials; preloaded bearings and floating units to reduce shock.

17948 A New Zinc-Aluminium-Copper Bearing Alloy. *Scientific Lubrication*, v. 9, Sept. 1957, p. 33-35.

Alzen 305 has excellent boundary lubrication properties. Test results are discussed.

17949* Metal Carbonates Coated With Salts of Low Molecular Weight Polycarboxylic Acids as Grease Thickeners. E. W. Nelson, et al. *Spokesman*, v. 21, Sept. 1957, p. 13-17.

Describes grease thickener which consists of a colloidal dispersion of a polyvalent metal carbonate coated by chemical interaction with a low mol. wt. polycarboxylic acid.

17950 (German.) Lubrication and Design of Sleeve Bearings. **Schmierung und Gestaltung von Gleitlagern. I.** Development and Principles of Sleeve Bearing Engineering. **Entwicklungslinie und Grundsätze der Gleitlagertechnik.** Karl Droste. *Stahl und Eisen*, v. 77, Aug. 22, 1957, p. 1135-1145.

Technical review. Pressures in the slide space and feed of the lubricant.

17951* (Russian.) Theory of a Cylinder Rolling on a Plate Covered With Visco-Plastic Lubricant. **Teoriia kacheniia tsilindra po poverkhnosti, pokrytoi sloem viazko-plastichnoi smazki.** L. I. Kotova. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1540-1557.

Integration of the Shvedov Bingham equation applied to the case of a cylinder rolling on a plate covered with visco-plastic lubricant. A differential equation for the hydrodynamic pressure is obtained.

See also: **17297** (manufacture of Ca and Li soap grease).

MECHANICAL ENGINEERING

17952 (English.) **The Plastic Theory of Curved Beams With Compressive Axial Forces. Theory and Tests.** P. Lange Hansen. *Acta Polytechnica (Civil Engineering Series)*, v. 4, no. 1, 1957, 32 p. (T1 Ac81 Vis.)

Method of calculating the collapse load consists in first determining the structural deflections in the collapse stage and next determining the collapse load in the deflected structure.

17953 (English.) **On the Possibilities of Estimating the Towing Resistance of Ships by Tests With Small Models. II.** Curt Falkemo. *Acta Polytechnica (Mechanical Engineering Series)*, v. 3, no. 9, 1956, 15 p. + 6 plates. (T1 Ac81 Vis.)

Two-meter models of ships can be used where the Reynolds number is larger than 10^7, provided that account is taken of the laminar regions of the wetted surfaces. A good idea of the extent and shape of these regions can be obtained by means of tests using the soluble film technique.

17954* Effect of Higher-Harmonic Deflection Components on the Creep Buckling of Columns. Sharad A. Patel and Joseph Kempner. *Aeronautical Quarterly*, v. 8, Aug. 1957, p. 215-225.

Higher-harmonic deflection components reduce the column lifetime significantly only when their initial amplitudes, as well as the initial amplitude of the first harmonic component are very large.

17955* Destructive Impulse Loading of Reinforced Concrete Beams. F. T. Mavis and M. J. Greaves. *American Concrete Institute, Journal*, v. 29, Sept. 1957, p. 233-252; *ACI Proceedings*, v. 54, 1957, p. 233-252.

Reinforced concrete beams, identical except for grade of reinforcement, were tested by pairs under destructive impulse loads in a unique spring-powered testing machine.

17956* Rotary Air Motors, Their Selection and Application. Keith A. Carlson. *Applied Hydraulics*, v. 10, Sept. 1957, p. 83-87.

Data on performance characteristics, size, weight, mounting arrangements, construction, and possible applications.

17957* High-Pressure Compressors Using Bladder-Type Accumulators. Larry Winston. *Applied Hydraulics*, v. 10, Sept. 1957, p. 143 + 4 pages.

17958 Selectroshift and Autoselectric Transmissions. *Automobile Engineer*, v. 47, Sept. 1957, p. 370-378.

Latest developments in the application of the Smiths magnetic particle coupling to semi- and fully-automatic transmission systems.

17959 Automated Door Assembly Line at Fisher Body Plant. Herbert Chase. *Automotive Industries*, v. 117, Sept. 1957, p. 56-59.

A pictorial presentation.

17960* Tests on I-Section Stanchions Bent About the Major Axis. Jacques Heyman. *British Welding Journal*, v. 4, Aug. 1957, p. 373-384.

Experimental results for the collapse loads of stanchions subjected to end thrust. Three lengths were used, corresponding to ratios of l/r of 198, 99, and 49.5. The longest stanchions behaved in a way that was largely elastic, while the shortest lengths behaved as stocky struts.

17961* (Russian.) The Solution of Two-Dimensional Problems in the Theory of Elasticity by Means of Special Functions. **Reshenie zadach ploskoi teorii uprugosti s pomosheh'iu spetsial'nykh funktsii.** M. Z. Narodetskii. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 729-732.

17962 Packaging: Industry Looks Ahead. Annesta R. Gardner. *Dun's Review and Modern Industry*, v. 70, Sept. 1957, p. 59 + 19 pages.

Future plans in packaging; new trends; package improvement.

17963* (Russian.) Acoustic Method of Detection of Cavitation on Running Hydro-Turbines. **Akusticheskii metod obnaruzheniia kavitatsii na rabotaiushchikh gidroturbinakh.** S. B. Stopskii. *Elektricheskie Stantsii*, v. 28, no. 8, Aug. 1957, p. 15-20.

Experimental method for determination of cavitation and vibration by means of sound waves originating in the stream of the hydro-turbine.

17964* (Russian.) The Double-Blade Hydraulic Turbine. **Dvukhperovaia gidroturbina.** Sh. P. Mikhanovskii. *Energomashinostroenie*, v. 3, no. 8, Aug. 1957, p. 1-4.

Construction and testing of a high-pressure double-blade turbine.

17965* (German.) Contributions to the Strength Behavior of Flanges With Welded Neck and to the Evaluation of the Scaling Forces of Some Soft Gaskets on the Asbestos Basis. **Beiträge zum Festigkeitsverhalten von Vorschweissflanschen und zur Ermittlung der Dichtkräfte für einige Flachdichtungen auf Asbestbasis.** S. Haenle. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, Ausgabe B, no. 4, 1957, p. 113-134.

A method for calculating the strength properties of bolted flanged connections with consideration of the applied screw forces and of the internal pressure.

17966* (German.) Ejector Pumps With Extremely High Flow Rate Ratio. **Ejektorpumpen mit extrem hohem Durchsatzverhältnis.** J. Rotta. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, Ausgabe B, no. 4, 1957, p. 157-167.

Theoretical considerations in connection with systematic measurements of flow rate, momentum, and pressure on ejector pumps at extremely high flow-rate ratios led to equations relating the essential design parameters of the problem.

17967 Calculating Pipe Stress Efficiently. K. Hao Hsiao. *Heating, Piping & Air Conditioning*, v. 29, Sept. 1957, p. 98-101.

Application of flexibility and stress intensification factors, allowable stress, stress range, maximum expansion stress, force and moment ranges, and hot and cold reactions; the phenomenon of self springing.

17968 Analysis of Stresses and Strains Near the End of a Crack Traversing a Plate. G. R. Irwin. *Journal of Applied Mechanics*, v. 24, Sept. 1957, p. 361-364.

17969 Finite Twisting and Bending of Thin Rectangular Elastic Plates. Eric Reissner. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 391-396.

An exact solution is obtained of the nonlinear equations for finite deflections of thin elastic plates, for a rectangular plate acted upon by twisting moments and bending moments simultaneously applied to two opposite edges of the plate.

17970 Dynamic Response of Beams and Plates to Rapid Heating. B. A. Boley and A. D. Barber. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 413-416.

The thermally induced vibrations of rectangular plates and beams under some typical heat applications are studied. The basic parameter of the problem is found to depend on the natural frequency of the structure and on a characteristic thermal time.

17971 A Study of the Propagation of Flexural Waves in Elastic Beams. E. A. Ripperger and H. Norman Abramson. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 431-434.

Experimental results for flexural wave propagation in elastic beams of circular cross sections resulting from very sharp impacts.

17972 Forced Vibration of Systems With Nonlinear, Nonsymmetrical Characteristics. S. Mahalingam. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 435-439.

A one-term approximate solution is given for the amplitudes of steady forced vibration of a single-degree-of-freedom system with a nonlinear (nonsymmetrical) spring characteristic.

17973 Stresses in Beams During Transverse Impact. K. E. Barnhart, Jr. and Werner Goldsmith. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 440-446.

17974* On Uniqueness and Stability in the Theory of Finite Elastic Strain. R. Hill. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 229-241.

There is a direct relation between the criterion for stability of an elastic solid in a state of finite strain and the criterion for a unique solution to the associated boundary-value problem set by given velocities and nominal traction-rates on its surface. The stability limit is characterized by eigenfunctions, or adjacent positions of equilibrium.

17975* Pure Bending of Pretwisted Rectangular Plates. L. Maunder and E. Reissner. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 261-266.

An exact solution is obtained within the framework of the linear theory of thin shallow elastic shells. Results may have application to turbine and compressor blades and to aircraft propellers.

17976* Plastic Bending of a Ring Sector by End Couples. W. M. Shepherd and F. A. Gaydon. *Journal of the Mechanics and Physics of Solids,* v. 5, no. 4, 1957, p. 296-301.

Exact values of the end couples necessary to produce incipient plastic flow in a thin plate in the form of a ring sector, bent in its own plane, are determined. Both the Mises and Tresca yield criteria and their associated flow rules are used.

17977 Creep Buckling of Cylindrical Shells. Erik Sundström. *Kungl. Tekniska Högskolans Handlingar (Transactions of the Royal Institute of Technology, Stockholm, Sweden),* 1957, no. 115, 34 p. (T4 K96t Vis.)

A double membrane andogy is used to determine the critical buckling time of a cylindrical shell subjected to external pressure.

17978 Longitudinal Stability. Jaroslav J. Taborek. *Machine Design,* v. 29, Sept. 5, 1957, p. 109-115.

Predicting tipping stability from dynamic moments, static moments, axle reactions, and moments of inertia.

17979 Torque-Tension Charts for Selection and Application of Socket-Head Cap Screws. Ralph W. Dicely and H. J. Long. *Machine Design,* v. 29, Sept. 5, 1957, p. 117-120.

17980 New Developments in Liquid Thread-Locking Agents. Robert H. Krieble. *Machine Design,* v. 29, Sept. 19, 1957, p. 129-134.

Characteristics of five liquid compositions recently introduced for fastener application.

17981 Designing Low-Cost Weldments. John Mikulak. *Machine Design,* v. 29, Sept. 19, 1957, p. 135-140.

An analysis of welding as a method of fabrication with pointers on optimum design of welded parts.

17982 17 Practical Solutions to Design Problems With Combination Spring Assemblies. Frank A. Votta, Jr. *Machine Design,* v. 29, Sept. 19, 1957, p. 159-161.

17983 Predicting Performance Failures. Gerald D. Cohen. *Machine Design,* v. 29, Oct. 3, 1957, p. 106-111.

A method for evaluating variability of a product and its environment, and applying these data in design decisions.

17984 Clamping With Fluid Power. H. L. Stewart and J. M. Moritz. *Machine Design,* v. 29, Oct. 3, 1957, p. 112-115.

Analysis of hydraulic and pneumatic clamping methods: what can be done, how to select proper fluid-power medium, what to consider in circuit design.

17985 Charts Simplify Calculation of Natural Frequencies of Beams. R. A. Ditaranto. *Machine Design,* v. 29, Oct. 3, 1957, p. 133-137.

Charts for rapid graphical solution of natural vibration frequencies of rectangular and tubular steel and Al beams under different end and load conditions.

17986 Designing With Permanent Magnet Materials. R. P. Smith. *Materials in Design Engineering,* v. 29, Sept. 1957, p. 126-128.

Design problems in fabricating hard, brittle materials of the Alnico type.

17987* Spring Design. XXIX. W. R. Berry. *Mechanical World and Engineering Record,* v. 137, Sept. 1957, p. 398-401.

The improvement of spring life by shot peening and methods of providing for it in design.

17988* (Russian.) Transmission of Pressure in the Depths of a Pressurized Heterogeneous Liquid. **Pronikanie davleniia v glub' szhimaemoi neodnorodnoi zhidkosti.** A. G. Bagdoev. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii,* v. 12, no. 2, 1957, p. 45-50.

Theoretical determination of the principle of variation of pressure in stratified and heterogeneous liquids while under a pressure originating on the free surface.

17989 (English, French, German, and Italian.) **Proceedings of the Eighth International Congress on Theoretical and Applied Mechanics. v. II.** 203 p. 1955. Faculty of Science, University of Istanbul, Turkey. (TA5 In8p8)

Plasticity theory, hydrodynamics, aerodynamics, turbulent diffusion, and stroboscopic methods are among the subjects discussed.

17990 Test Results Guide—High Temperature Design of Bolted Assemblies. Steven S. Silwones and Robert A. Degen. *Product Engineering,* v. 28, Sept. 30, 1957, p. 79-83.

Presents materials recommended for bolts and structures subjected to temperatures up to 1300 F.

17991 Differential Springs Can Simulate Load. George H. Logan. *Product Engineering,* v. 28, Sept. 30, 1957, p. 110-111.

Analysis of forces and effect of frictional resistance in differential spring systems using two preloaded springs operating back-to-back.

17992 Thirteen Ways to Couple Fractional-Horsepower Motors. Walter Strand. *Product Engineering,* v. 28, Sept. 30, 1957, p. 120-121.

17993 Air Springs for Suspension. Dunlop's Pneumatic System. *Rubber Journal,* v. 133, Sept. 14, 1957, p. 359-360.

17994 Determination of Crippling Stresses for Curved Frames of Alclad 24S-T in Bending. Gunnar Anevi. *SAAB Aircraft Company, Technical Notes, SAAB TN* 36, 1957, 73 p. (TL504 Sv23t Vis.)

17995 Algebraic Methods for the Numerical Analysis of Built-Up Systems. B. Langefors. *SAAB Aircraft Company, Technical Notes, SAAB TN* 38, 1957, 55 p. (T1504 Sv23t Vis.)

An analysis of systems which may be regarded as a built up from a set of connected elements resulted in a treatment by the concept of transference, a procedure for solving systems of equations in a piecewise manner.

17996 The Design of Pistons and Piston Rings. G. H. Clark. *Scientific Lubrication*, v. 9, Sept. 1957, p. 18-25.

17997* (German.) Strain Measurements on a Thin Wheel-Disc for a 20-Ton Wheel-and-Axle. **Spannungsmessungen an einer Leichtradscheibe für einen 20-t-Radsatz.** H. Deutler. *Technische Mitteilungen Krupp*, v. 15, Aug. 1957, p. 59-67.

A study of the stress distribution in a metal wheel disc in order to detect critical points. Determination of tensile strains after shrinking on the tire and pressing the axle.

17998* (Russian.) On the Mechanism of Cavitation in Centrifugal Pumps. **K voprosu o mekhanizme kavitatsii v tsentrobezhnykh nasosakh.** V. F. Chebaevskii. *Teploenergetika*, v. 4, no. 9, Sept. 1957, p. 12-16.

Experimental and theoretical studies of cavitation in the flow part of a series of centrifugal pumps.

17999 Practical Solution of Plastic Deformation Problems in Elastic-Plastic Range. A. Mendelson and S. S. Manson. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4088, Sept. 1957, 52 p. (TL570 Un3t)

Method is one of successive approximations and is illustrated by four examples which include a flat plate with temperature distribution across the width, a thin shell with axial temperature distribution, a solid cylinder, with radial temperature distribution, and a rotating disk with radial temperature distribution.

18000 Snap-Through and Post-Buckling Behavior of Cylindrical Shells Under the Action of External Pressure. Henry L. Langhaar and Arthur P. Boresi. *University of Illinois Engineering Experiment Station Bulletin No.* 443, Apr. 1957, 40 p. (T1 I6b Vis.)

The ends of the shell are assumed to provide simple support to the cylindrical wall. Accordingly, the radial and circumferential displacement components of the middle surface of the wall vanish at the ends. If the ends of the shell are free to warp, no other constraint is imposed on the deformation. If the ends of the shell are rigid, the axial displacement is constant at either end. Both of these cases were investigated.

See also: **17109** (hydraulic systems); **17604** (selection and evaluation of hydraulic pumps and actuators); **17805** (design of hydraulic circuits); **17947** (reduction of bearing shock loads); **18111** (design of die-castings); **18617** (design of welds).

METALLURGY

18001 A.C.I. Data Sheets: Corrosion-Resistant Types. Not paged. 1954. Alloy Casting Institute, Mineola, N. Y. (TS230 AL57a)

Properties, heat treatment, application, design, fabrication, welding, and corrosion data on 14 alloys.

18002 A.C.I. Data Sheets: Heat Resistant Types. Not paged. 1957. Alloy Casting Institute, Mineola, N. Y. (TS230 AL57ah)

Properties, heat treatment, applications, design, fabrication, welding, machining, and corrosion data on 14 alloys.

18003* (German and French.) Aluminum in the Manufacture of Chemical Equipment. **Aluminium im chemischen Apparatebau.** E. Moor. *Aluminium Suisse*, v. 7, July 1957, p. 150-164.

Processing Al and its alloys. Chemical and electrolytic surface treatment. Varnishing and painting. Assembly and maintenance. Applications.

18004* **Niobium as a Nuclear Metal.** M. J. Cotter. *Atomics & Nuclear Energy*, v. 8, Sept. 1957, p. 339-342.

Resources, separation, preparation of metal; chemistry; prices; metallurgical aspects; fabrication; compatibility with U.

18005* (Dutch.) More Experience With Titanium Gives a Better Understanding of Its Application. **Meer ervaring met titanium geeft beter inzicht in wijze van toepassen.** T. van der Klis. *Bedrijf en Techniek*, v. 12, no. 286; *Electronica section*, v. 10, no. 233, Aug. 24, 1957, p. 575.

Advantages and disadvantages of Ti. Non-military applications in aeronautics, chemical, food, paper, metal, and petroleum industries, and in electricity, electronics, medicine, and atomic energy.

18006 Reactor Metallurgy. *Bettis Technical Review (U. S. Atomic Energy Commission)*, v. 1, July 1957, 130 p. (UF767 Un3.1wb Contin.)

Wear and friction of materials in room temperature and 500 F high purity water. Progress in the resolution of anomalous Zr alloy corrosion problems. An extension of long range order theory for AB_2 alloys. Radiographic inspection of nuclear core materials and components. Eddy current tests for zircaloy core components.

18007 Boron, Calcium, Columbium, and Zirconium in Iron and Steel. R. A. Grange, et al. 533 p. 1957. John Wiley & Sons, New York. (Tn756 B64)

Four monographs compiled from published and unpublished data on these alloying elements and their effects. Includes sources, extraction, and properties.

18008 Theory and Calculation of Induction of Elastic Oscillations in Molten Metal. I. I. Teumin. *Henry Brutcher Translation No.* 3930, 30 p. (From *Problems of Metallography and Metal Physics*, 1955, p. 50-69. Fourth collection of papers, published by the State Sci. & Tech. Publishing House for ferrous and NF Literature, Moscow.) Henry Brutcher, Altadena, Calif.

Detailed study of effect of mechanical oscillations on the crystallization of metals and the potentialities of their practical application, with special reference to the induction of elastic waves in the ultrasonic range in the liquid metal directly. Methods of inducing elastic oscillations in metal melts.

18009 Aluminum Alloys for Handling High-Purity Water. W. W. Binger and C. M. Marstiller. *Corrosion*, v. 13, Sept. 1957, p. 591t-596t.

The increased use of the ion exchange method for purifying water has required equipment fabricated from materials in which such a water could be handled with a minimum of pick-up and discoloration.

18010* High-Nickel Alloy Spring Materials. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 102-107.

High strength at high temperature and resistance to corrosion make many of the high-Ni alloys suitable for springs for electrical and electronic application. Electrical conductivity and non-magnetic properties are also governing selection factors. Heat-treating procedures for obtaining optimum mechanical properties are given.

18011 Handling and Uses of the Alkali Metals. 177 p. 1957. American Chemical Society, Washington, D. C. (QD172.A4 Am35h)

18012* (Czech.) Extra High Strength Structural Steel. **Konstrukční ocele se zvláště velkou pevností.** Jan Korecký. *Hutník*, v. 7, no. 8, Aug. 1957, p. 257-258.

Modern aviation and its influence on development of superior structural steels. Effect of addition elements and heat treatment on steel properties. Tables of average chemical composition and of heat treatment of extra-high-strength steels.

18013 High-Boron Alloy Steels. T. H. Middleham, J. R. Rait, and E. W. Colbeck. *Iron and Steel Institute, Journal*, v. 187, Sept. 1957, p. 1-14.

New production technique for alloys containing up to about 4.75% B which can be successfully forged, rolled, and extruded, and alloys up to about 6% B which can be successfully produced in the form of castings. Alloy properties, constitution, and applications in thermal nuclear reactors.

18014* (Russian.) Melting and Self Diffusion in Hard Metals. **Plavlenie i samodiffuziia v tverdykh metallakh.** K. A. Osipov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 7, July, p. 35-40.

Theoretical discussion and calculation of the phenomenon.

18015 New Nickel Alloys for High Temperature Service. Randolph P. Dominic. *Materials in Design Engineering*, v. 46, Sept. 1957, p. 115-119.

Modification of Ni-Cr and Ni-Cr-Fe alloys has resulted in new alloys with good high temperature characteristics.

18016 High Strength Aluminum Castings. John V. Houston, Jr. *Materials in Design Engineering*, v. 46, Sept. 1957, p. 124-125.

Properties and applications.

18017 Two Promising New Titanium Alloys. S. Abkowitz and Dillon Evers. *Metal Progress*, v. 72, Sept. 1957, p. 97-102.

An alloy with 2.5% Al and 16% V is readily formable and then age hardened to 160,000 psi. yield strength retaining 5% elongation. An α alloy with 8% Al, 2% Cb, and 1% Ta is weldable in bar and sheet form and extends the temperature limit of usefulness 200 F over conventional α alloys.

18018* The Nimonic Alloys. Design Data. 4th Ed. 54 p. 1956. Henry Wiggins & Co., Birmingham, England. (TA490 W63n4 Ref.)

Tabular and graphic data on general properties of 12 alloys.

18019* Uranium and Its Alloys. R. W. Nichols. *Nuclear Engineering*, v. 2, Sept. 1957, p. 355-364.

Mechanical, physical, chemical, and metallurgical properties. Effects of irradiation, thermal cycling, fabrication history, and alloy additions.

18020 (German.) Metallic Heat Conducting Materials for High Temperature Furnaces. **Metallische Heizleiterwerkstoffe für Hochtemperaturöfen.** R. Kieffer and F. Benesovsky. *Planseeberichte für Pulvermetallurgie*, v. 5, no. 2, Aug. 1957, p. 56-71.

Physical properties of Mo, W, Ta, and $MoSi_2$. Their behavior in different atmospheres. Applications.

18021* (Polish.) Gases in Copper and the Production of Bus-Bars. **Gazy w miedzi a proces wytwarzania wire-barsów.** Jan Golonka. *Rudy i Metale Niezelazne*, v. 2, no. 2, June 1957, p. 53-61.

Study of a gas-copper system during the melting and casting processes of high-conductive Cu. Application to the production of bus-bars of an average 8.5 g./cc. density.

18022 Progress in Vacuum Melting Opens New Horizon. F. M. Richmond. *SAE Journal*, v. 65, Sept. 1957, p. 28-31.

Vacuum melting makes possible more ductile Ni-base alloys. Properties of various super alloys are evaluated.

18023 (German.) New Methods of "Hot" Cooling. **Neue Verfahren der Heisskühlung.** Rudolf Vonnemann. *Stahl und Eisen*, v. 77, Aug. 22, 1957, p. 1126-1135.

Cooling of heating and melting furnaces, glass furnaces, and converter stacks.

18024 Tool Steels. Materials for Machine Tool Service. V. L. F. Spencer. *Steel Processing and Conversion*, v. 43, Sept. 1957, p. 511 + 7 pages.

Properties and applications of water and oil hardening steels.

18025* The Physical Chemistry of Steelmaking. *TISCO (Special No.)*, v. 4, July 1957, 92 p.

Consists of ten papers on the chemistry of slags and steel constituents including C, Si, P, S, O, Mn, H, and W.

18026 Tungsten. K. C. Li and Chung Yu Wang. 3rd Ed. 506 p. 1955. Reinhold Publishing Corp., New York. (TN799.T9 L61t3)

History, geology, ore-dressing, chemistry, metallurgy, analysis, applications, and economics.

18027 Resumé of Uranium Alloy Data. XI. E. F. Losco and J. Belle. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-PWR-PMM-601, Feb. 1956, 66 p. (UF767 Un3.1wa Contin.)

Includes data on corrosion resistance, properties, irradiation effects, UO_2 development, fabrication, and phase diagrams.

18028 Magnesium Alloys With High Melting Point Additions. R. R. Nash, et al. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 55-207, Mar. 1957, 180 p. (TL507 Un3.18w Vis.)

An exploratory investigation was made to determine the alloying characteristics and the influence on micro-structure, mechanical properties, and resistance to corrosion of small additions of Ti, Hf, Ta, Ni, Co, V, B, Cr, Y, Re, Nb, W, and Mo to Mg and its alloys.

18029 Year Book of American Iron and Steel Institute, 1957. 309 p. American Iron and Steel Institute, New York. (TS300 Am35y Vis.)

Includes papers on the quench and temper process for manufacturing high strength tubular products, production and use of Ti, process and quality control, and controlled air distribution for the blast furnace.

See also: **17272** (Al alloys for heat exchangers); **17284** (constructional materials for chemical plants); **17349** (determination of occluded hydrogen); **17651** (electrical power distribution systems for steel mills); **17781** (1956 survey of Canadian iron ore industry); **17787** (ferrous metallurgy in Brazil); **17819** (Al containers for food); **17939** (steel mill lubricants); **17940** (silicone lubricants for steel mills); **17948** (Zn-Al-Cu bearing alloy); **17986** (production of permanent magnets); **18189** (Al can manufacture); **18462** (physics of metals); **18497** (toolsteels for molding plastics).

METALS—CORROSION

18030 (English.) **On the Mechanism of the Oxidation of Metals.** D. A. Vermilyea. *Acta Metallurgica*, v. 5, Sept. 1957, p. 492-495.

During the low-temperature oxidation of a metal whose oxide is a cation conductor, it is assumed that metal atoms enter the oxide only at lattice steps on the metal surface and that new oxide forms only at the oxide-atmosphere interface.

18031 (French.) Lessons on Electrochemical Corrosion. **Leçons sur la corrosion electrochimique. III.** M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 49, July 1957, 68 p. (TA462 C33r Vis.)

Electrochemical equilibria. Oxidation and reduction. Galvanic cells. Electrochemical reactions. Equilibrium diagrams of H_2O with Cu, Ag, Pb, Sn, Fe, Zn, Al, and As.

18032 Corrosion Fatigue. T. D. Weaver. *Chemistry & Industry*, 1957, no. 36, Sept. 7, p. 1190-1194.

Points out the deleterious effect of combined corrosion and cyclic stress, the mechanism of failure under such conditions, and the counter-measures which can be taken.

18033 Corrosion of Metals in Buildings. The Performance of Zinc and Zinc Coatings. R. W. Bailey and H. G. Ridge. *Chemistry & Industry*, 1957, no. 37, Sept. 14, p. 1222-1227.

18034 Resistance to Corrosion of Aluminum Alloys for Automotive Applications. E. T. Englehart, W. C. Cochran, and E. P. White. *Corrosion*, v. 13, Sept. 1957, p. 555t-560t.

Information on the resistance to corrosion of Al alloys for many new uses. Particular emphasis has been placed on performance of Al alloys for automotive trim, but other applications are also covered.

18035 Corrosion and Metal Transport in Fused Sodium Hydroxide. I. Experimental Procedures. G. Pedro Smith, Mark E. Steidlitz, and E. E. Hoffman. *Corrosion*, v. 13, Sept. 1957, p. 561t-564t.

Experimental techniques are described for studying the above at temperatures up to 815 C. The apparatus described is designed for small-scale testing.

18036 Investigation of Inorganic Inhibitors for Minimizing Galvanic Corrosion of Magnesium Coupled to Aluminum. Sara J. Ketcham and Walter Beck. *Corrosion*, v. 13, Sept. 1957, p. 608t-614t.

Corrosion current measurements may serve as a useful tool for the determination of effectiveness of inhibitors, but the method should not be used indiscriminately.

18037 Cathodic Protection of Underground Refinery Equipment. P. W. Sherwood. *Corrosion Technology*, v. 4, Sept. 1957, p. 313-317.

18038* (Russian.) Anodic Passivation of Chromium in Acid Solutions. **Anodnaia passivatsiia khroma v kislykh rastvorakh.** V. M. Kniazheva and Ia. M. Kolotyrkin. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1265-1268.

The electrochemical behavior of pure Cr was studied by the potentiometric method during its passivation in 0.01, 0.10, and 1.0 *N* solutions of H_2SO_4.

18039* Corrosion Resistance of Titanium to Sea Water. J. B. Cotton and B. P. Downing. *Institute of Marine Engineers, Transactions*, v. 69, Aug. 1957, p. 311-319.

Basic physical properties of Ti. Behavior during immersion in sea water; erosion in sea water and wet steam; crevice attack. Galvanic behavior of Ti in dissimilarmetal couples. Stress corrosion. Economic aspects.

18040* Cathodic Protection. L. B. Hobgen, K. A. Spencer, and P. W. Heselgrave. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Aug. 1957, p. 307-319.

Mechanisms of electrolytic corrosion. Practical methods of applying cathodic protection. Electrical survey of buried structures. Main applications of cothodic protection and the general economics affetcing its use.

18041 Stopping Corrosion With Rust Preventive Compounds. R. P. Mills. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 96-100.

Types of compounds and their applications.

18042* (English.) **Studies on Corrosion Resistance of Titanium Alloys. III. Corrosion Resistance of Ti-Ag, Ti-Cu, Ti-Fe, Ti-Co, Ti-W and Ti-Sn Alloys.** Susumu Yoshida, Shigetake Okamoto, and Takashi Araki. *Journal of Mechanical Laboratory (Japan)*, v. 3, no. 1, 1957, p. 56-58.

Tabulated data for various test solutions at ordinary and boiling temperatures.

18043 Strain Electrometry and Corrosion. II. Chemical Effects With Copper Electrodes. Albert G. Funk, J. Calvin Giddings, Carl J. Christensen, and Henry Eyring. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1179-1183.

The potential transient induced in a Cu electrode through mechanical strain is studied as it depends upon the concentration of various solutions.

18044* (Polish.) Study of Cathodic Protection With Stray Currents. **Badania nad ochroną katodową przed korozja prądami błądzącymi. II.** Distribution of Stray Current in a Pipe at Non-Concentrated Current Load. **Rozkład natężenia prądu błądzącego przy nieskupionym obciążeniu prądowym.** S. Minc and Z. Feldblum. *Przemysł Chemiczny*, v. 13, no. 7, July 1957, p. 382-383.

Laboratory method of investigating the distribution of diffuse stray currents in a buried pipe and its cathodic protection.

18045 On Oxidation Mechanisms of Metals and Alloys. J. Markali. *Research*, v. 10, Sept. 1957, p. 367-369.

A study of Ti and Ti alloys.

18046 New Ways to Fight Corrosion. *Steel*, v. 141, Aug. 26, 1957, p. 68-71.

Cathodic protection; inhibitors; resistant materials; coatings. (To be continued.)

18047* (Russian.) Investigation of Resistance of Galvanized and Nitrided 38KhMIuA Steel Against Cavitation Erosion. **Issledovanie kavitatsionno-erozionnoi stoikosti otsinkovannoi i azotirovannoi stali 38KhMIuA.** I. N. Bogachev, Ia. M. Gitel'zon, T. M. Pogrebetskaia, and A. A. Iurgenson. *Vestnik Mashinostroeniia*, v. 37, no. 9, Sept. 1957, p. 24-26.

Effect of nitriding and galvanizing on the resistance to cavitation erosion.

18048* Protection of Equipment by Effective Corrosion Control. J. M. Meeker. *Water & Sewage Works*, v. 104, Sept. 1957, p. 401-405.

Describes cathodic protection as the one method by which corrosion rate can be reduced to zero.

18049 Stress Corrosion of Titanium Weldments. Russell Meredith and W. L. Arter. *Welding Journal*, v. 36, Sept. 1957, p. 415s-418s.

Shows that chlorinated hydrocarbon solution causes the development of stress corrosion cracks when placed in contact with RC-A110-AT alloy at 700 F.

18050* (Serbian.) Inhibiting Effect of Sodium Benzoate on the Atmospheric Corrosion of Mild Steel. **Inhibitorsko djelovanje natrijevog benzoata na atmosfersku koroziju mekog čelika.** O. Sarc-Lahodny. *Zaštita Materijala*, v. 4, no. 10, Oct. 1956, p. 324-327.

An aqueous solution containing as little as 1% of sodium benzoate affords complete protection in alternate immersion tests. A suspension of sodium benzoate in machine oil has a much more pronounced inhibitive effect than the oil alone, all other factors being equal.

See also: **17476** (reaction of Zr with UO_2); **17542** (oxidation of Si); **17681** (atmospheric corrosion testing of electrodeposits); **18280** (corrosion testing of radioactive materials).

METALS—EXTRACTION AND REFINING

18051* (Portuguese). An Experimental Study of Sponge Iron Production in 26% Cr Cast Iron Containers. **Estudo experimental sôbre a produção de ferro-esponja em recipientes de ferro fundido com 26% Cr.** Tharcisio D. De Souza Santos. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Apr. 1957, p. 67-128.

In a furnace making about 150 kg. of sponge Fe per cycle the effects of processing variables on the reduction of the ore and the subsequent carbonization of the metal were studied at 850 to 1050 C. Pulverized Fe ore and powdered charcoal or coke were used.

18052 The Basic Oxygen Process. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel*, Apr. 1957, 6 p. (TN705 Am35c Vis.)

"Basic oxygen steel" is defined as a steel which is considered to be the equivalent of basic open-hearth steel, and whose residual N content is not in excess of 0.007%. Furnace design and operation; chemistry of the refining process.

18053 Development of Controlled Air Distribution for the Blast Furnace. J. M. Stapleton. *Blast Furnace and Steel Plant*, v. 45, Sept. 1957, p. 1007-1017.

Uniform wind to the tuyeres results in more uniform tuyere performance and more uniform inwall gas flow temperatures around the furnace periphery. Tendency for heavy lime formations at the tuyeres is minimized.

18054 Vacuum Treatment of Steel. V. G. Speranskii. *Henry Brutcher Translation No.* 3973, 8 p. (From *Metallurg*, 1956, no. 8, p. 12-15.) Henry Brutcher, Altadena, Calif.

Vacuum treatment of transformer steel considerably improves the quality of the finished steel through lowering the contents of C, S, and gases in the ingots. Pouring a high alloy steel containing Al and Ti in an inert atmosphere improves the quality of the casting.

18055 Quality of Steel Ingots Improved by Ultrasound Treatment. N. P. Nikolaichik and E. N. Nikolaichik. *Henry Brutcher Translation No.* 3985, 8 p. (From *Stal'*, v. 17, no. 4, 1957, p. 322-325.) Henry Brutcher, Altadena, Calif.

Casting of Fe-C alloys under the action of ultrasound improves their macro- and micro-structures, considerably decreases the solubility of gases in them, and improves their mechanical properties.

18056 Use of Vacuum in Ferrous Metallurgy. G. A. Garnyk. *Henry Brutcher Translation No.* 3989, 7 p. (From *Stal'*, v. 16, no. 7, 1956, p. 661-662.) Henry Brutcher, Altadena, Calif.

Data on quality improvement obtained with transformer iron, Cr-Ni stainless and constructional steels, high-purity Mo, ductile V, very low C ferrochrome, Mn metal, and Cr metal.

18057 Production of Medium-Carbon Ferrochromium. P. A. Sakharuk. *Henry Brutcher Translation No.* 3995, 12 p. (From *Stal'*, v. 17, no. 4, 1957, p. 326-328.) Henry Brutcher, Altadena, Calif.

Comparison of various methods. Oxygen process in relation to energy consumption. Mixing process as a suitable alternative.

18058 Treatment of Electric Furnace Steel Under Vacuum. G. M. Borodudin. *Henry Brutcher Translation No.* 3999, 7 p. (From *Metallurg*, 1957, no. 5, May, p. 16-18.) Henry Brutcher, Altadena, Calif.

Equipment and operating procedure for ladle treatment. Result obtained in large-scale production trials.

18059 A Process of Direct Reduction of Iron Ore Concentrate by Carbon Monoxide Without Fusion. O. Stelling and I. Pereswetoff-Morath. *Henry Brutcher Translation No.* 4000, 33 p. (From *Jernkontorets Annaler*, v. 141, no. 5, 1957, p. 237-260.) Henry Brutcher, Altadena, Calif.

Laboratory and pilot-plant experiments. Advantages claimed for proposed process: process can be made part of a continuous system; size of plant can be varied within wide limits; investment costs are low; heat economy is good; operation occurs at atmospheric pressure; end products are cementite or cementite + wustite; no cooling or heating cycles for reducing gas are required.

18060 Influence of Alkaline-Earth Metal Oxides Upon Distribution of Sulfur Between Iron and Iron-Containing Slag. L. A. Shvartsman, I. A. Tomilin, O. V. Travin, and I. A. Popov. *Henry Brutcher Translation No.* 4001, 22 p. (From *Problemy Metallovedeniya i Fizika Metallov*, 1955, p. 577-594. Fourth collection of papers, published by the State Sci. & Tech. Publishing House for ferrous and NF literature, Moscow.) Henry Brutcher, Altadena, Calif.

Study of slag conditions most conductive to S removal from liquid Fe, with special reference to temperature dependence of the S distribution equilibrium and the influence of Mg, Ca, and Ba oxides on this equilibrium.

18061 Influence of Sulfur Upon Interphase Tension at Metal/Slag Boundary. S. I. Popel, O. A. Esin, G. F. Konovalov, and N. S. Smirnov. *Henry Brutcher Translation No.* 4002, 6 p. (From *Doklady Akademii Nauk, SSSR*, v. 112, no. 1, 1957, p. 104-106.) Henry Brutcher, Altadena, Calif.

18062 Mold Design for Continuous Casting of Steel. G. I. Kozlitin and I. N. Kolybalov. *Henry Brutcher Translation No.* 4004, 10 p. (From *Stal'*, v. 17, no. 3, 1957, p. 209-213.) Henry Brutcher, Altadena, Calif.

Trials with a new self-aligning reciprocating mold of reduced weight and cost resulted in elimination of sticking and longer mold life, with the possibility of remote control and automation of the continuous casting process.

18063 Conveyor Machine for Continuous Casting of Steel. M. F. Goldobin. *Henry Brutcher Translation No.* 4005, 15 p. (From *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Odessa, Oct. 1955, Moscow, 1956, p. 111-118.) Henry Brutcher, Altadena, Calif.

Design and operation of machine on which billet moves together with, and at the same speed as, the mold. Lubrication to avoid sticking of metal and ensure good surface quality of billet. Casting of complex sections.

18064 Projected Continuous Casting Machine According to Goldobin for Medium-Output Open-Hearth Steel Plants. G. A. Garbuz. *Henry Brutcher Translation No.* 4006, 8 p. (From *Proceedings of the First All-Union Conference on the Continuous Casting of Steel*, Odessa, Oct. 1955, Moscow, 1956, p. 119-122.) Henry Brutcher, Altadena, Calif.

Description and operation of near-horizontal machine.

18065* (Russian.) A Study of Blast Furnace Process by Means of Isotopes. **Izuchenie domennogo protsessa metodom izotopov.** I. P. Bardin, P. L. Gruzin, and S. V. Zemskii. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1220-1223.

Study of the blast furnace charge, its movement, wear of the refractory lining, and behavior of gases.

18066 Conversion Chemistry of Plutonium Nitrate. K. M. Harmon and W. H. Reas. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49597 A, Apr. 1957, 25 p. (UF767 Un3.1hw Contin.)

Data pertinent to the individual processes involved in the conversion of Pu from Pu nitrate-HNO_3 solutions to Pu metal.

18067* (Czech.) Chill Casting of Steel. **Jak odlévat ocel do kokil.** A. Děkanovský, et al. *Hutnik*, v. 7, no. 8, Aug. 1957, p. 259-266.

Advantages and disadvantages of chill casting methods. Comparison of chill casting of killed and rimmed steels with top and bottom pouring. Top pouring as most advantageous and economical method, especially for casting heavy ingots.

18068 Continuous Cold Trap for Fluoride Volatility Processing of Uranium. J. C. Bresee and P. R. Larson. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1349-1354.

Designs consists of an internally cooled column containing a fluidized inert carrier which is removed continuously, stripped by superheated uranium hexafluoride vapor, and recycled to the column.

18069 New Hot Top Cuts Ingot Discard in Half. William Czygan. *Iron Age*, v. 180, Sept. 12, 1957, p. 123-126.

The Vallak hot top boosts ingot yield, raises mill output, makes cleaner steel, eliminates preheating, cuts down sloppy pours, simplifies mounting, reduces mold requirements, eliminates maintenance, simplifies storage, and lowers first cost.

18070 How to Select a Vacuum Arc Furnace. L. L. Johnson. *Iron Age*, v. 180, Oct. 3, 1957, p. 96-99.

Selection should be based on ingot size, electrode size and formation, the vacuum system, power supply, and safety, work handling, and housing aspects.

18071 Increasing Open Hearth Capacity. I. Fuel's Contribution to Increased Open Hearth Capacity. C. W. Dunn. **II. Increasing Open Hearth Capacity by Extending the Hearth.** Charles D. Guth. **III. Increasing the Capacity of an Open Hearth Shop.** M. K. Morris. *Iron and Steel Engineer*, v. 34, Aug. 1957, p. 57-72.

18072 Proposal for a Self-Lining Blast-Furnace. W. A. Archibald, T. P. Brown, and L. A. Leonard. *Iron and Steel Institute, Journal*, v. 187, Sept. 1957, p. 32-45.

Baffles trap material from the charge to act as a self-renewing refractory lining, and stack tuyeres are used to control hanging and scaffolds.

18073* The Role of Evaporation in Zone Refining Indium Antimonide. K. F. Hulme and J. B. Mullin. *Journal of Electronics and Control*, v. 3, Aug. 1957, p. 160-170.

The important acceptor impurities Zn and Cd are volatile from molten InSb. The removal of acceptors by volatilization under appropriate experimental conditions, followed by zone refining, can yield material with less than 10^{14} excess donors per cm^3.

18074 Nonferrous Operations. *Journal of Metals*, v. 9, Sept. 1957, p. 1113-1128.

Reviews current operations at the Gaspe smelter, the El Paso smelter, the San Manuel smelter, and Cominco's Zn smelting and casting facilities.

18075 Continuous Steel Casting in France. Rene Fievet. *Journal of Metals*, v. 9, Sept. 1957, p. 1129-1131.

Operation at the Cail plant, Europe's largest installation.

18076 An Efficient Method of Desulfurizing Liquid Pig Iron. B. Trentini, L. Wahl, and M. Allard. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Sept. 1957, p. 1133-1139.

A process based on lime-blowing is described.

18077* (Russian.) Thermal Conditions in the Open-Hearth Smelting Process With Oxygen Blowing Through the Bath. **Teplovoi rezhim martenovskoi plavki pri produvke vanny kislorodom.** V. T. Sladkoshteev and G. A. Podol'skaia. *Metallurg*, 1957, no. 8, Aug., p. 21-22.

Two experiments to study simultaneous delivery of O through the burner and the bath, and thermal conditions in the furnace during the process. In one case both ways of blasting were used; in the other through the bath only. The results show that simultaneous use of O in both burners and bath does not

decrease the duration of smelting and does not speed up the oxidation of C and P, but increases the O consumption and results in an over-heated furnace roof. Therefore O blasting through the bath only is recommended.

18078* (Russian.) Method of Controlling the Blast Furnace Process. **Metod korrektirovaniia parametrov domennoi plavki.** A. N. Red'ko. *Metallurg*, 1957, no. 9, Sept., p. 3-5.

Development of method of control by correction of ore charges, consumption of limestone, thermal conditions of the furnace, and other parameters. Determination of a relationship between various conditions of the process and coke consumption.

18079* (Russian.) Checking Blast Furnace Operation by Difference of Static Pressures. **Kontrol' khoda domennykh pechei po raznosti staticheskikh davlenii.** P. G. Baranovskii and A. A. Kargin. *Metallurg*, 1957, no. 9, Sept. 1957, p. 5-7.

Description and experimental study of a gas intake installation which permits measurement of static pressure changes inside the furnace. Samples of recorded pressure changes are shown.

18080 The Production of Zinc in a Blast Furnace. S. W. K. Morgan. *Metallurgia*, v. 56, Sept. 1957, p. 115-120.

The furnace gases, which typically contain 5-6% Zn and 8-10% CO_2 are brought into contact with a shower of molten Pb, whereby 89% of the Zn vapor is condensed and recovered as metal. The process can be applied to mixed Pb-Zn concentrates, the Pb being tapped from the bottom of the furnace.

18081 Casting Large Ingots of Uranium. G. W. P. Rengstorff and H. W. Lownie, Jr. *Metal Progress*, v. 72, Sept. 1957, p. 76-78.

Sound ingots, 7-in. diameter, weighing 1200 lb. and with 91 to 95% recovery in metal, can be cast in iron molds after induction melting the U "derbies" in magnesia or graphite crucibles under open argon atmosphere. A small amount of $BaCl_2$, added shortly before pouring, protects the stream of molten metal from oxidation.

18082 Superpurity Nickel Melted Under Controlled Atmospheres. K. M. Olsen. *Metal Progress*, v. 72, Sept. 1957, p. 105-109.

High purity Ni can be made by melting sintered slugs of carbonyl Ni powder in magnesia crucibles under a definite program of H, vacuum, and He. The process is also effective for high purity binary Ni alloys and Fe alloys.

18083 Pyrochemical Separation Methods. II. The Distribution of Plutonium and Fission Products Between Uranium and Magnesium. Rex A. Barney and Francis J. Keneshea, Jr. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1324, Aug. 1955, 23 p. (UF767 Un3.1na Contin.)

Distribution coefficients were determined and in most instances found to be fairly constant over a range of concentrations, extraction times, and uranium-extractant metal ratios.

18084* (Russian.) Improvement in Smelting Boron Carbide. **Usovershenstvovanie plavki karbida bora.** O. F. Lapina, et al. *Promyshlennaia Energetika*, 1957, no. 8, Aug., p. 17-18.

Smelting of boron carbide in a three-phase electric furnace resulted in increased production and lower costs. Smelting in this furnace decreased the power consumption per ton of production from 24.38 to 18.500 kw.-hrs.

18085 Vacuum Melting of Steels Improves Engineering Properties. H. C. Rezeau, Jr. *SAE Journal*, v. 65, Sept. 1957, p. 67-71.

Bearing, valve and stainless alloy, and low-alloy steels are discussed.

18086* (French.) A New Profile of the Open-Hearth Furnace. **Un nouveau profil de four martin.** E. Boelens. *Silicates Industriels*, v. 22, July-Aug. 1957, p. 404-409.

Advantages and disadvantages of the classical shape. Heat losses are decreased by reducing the inside roof surface. Economy of fuel and time.

18087* (Russian.) Perfecting the Technology of Rimmed Steel Deoxidation. **Usovershenstvovanie tekhnologii raskisleniia kipiashchei stali.** A. A. Bezdenezhnykh, A. M. Bigeev, E. I. Dikshtein, P. N. Perchatkin, and A. I. Sirotenko. *Stal'*, v. 17, no. 8, Aug. 1957, p. 701-707.

Calculation of quantity of ferromanganese to be added to rimming steel at the start of tapping.

18088* (Russian.) The Production of High Purity Lead. **Poluchenie svintsa vysokoi chistoty.** Ia. Z. Malkin, V. Ia. Sergienko, and I. G. Iudelevich. *Tsvetnye Metally*, v. 30, no. 8, Aug. 1957, p. 44-51.

Production of pure Pb by pyrometallurgy from electrolytic cathode Pb. Production of Pb of required purity by pyrometallurgy from cathode lead without repeated electrolysis. Rapid determination of Ag and Cu content of the Pb.

18089 Electric Smelting of Cuban Serpentine and Laterite Nickel Ores. Wallace E. Anable and Lloyd H. Banning. *U. S. Bureau of Mines, Report of Investigations* 5346, July 1957, 24 p. (TN21 Un3r)

Direct carbothermic reduction to produce low-carbon ferronickel.

See also: **17228** (purification of nuclear fuels); **17241** (magnesite-slag basic openhearth bottom); **17242** (steel teeming ladle lining); **17245** (carbon lining for arc furnace); **17246** (chamotte ladle brick); **17247** (Al_2O_3 - SiO_2 blast furnace refractories); **18464** (zone melting).

METALS—FINISHING, POLISHING, AND CLEANING

18090* Precision Barrel Finishing. IV. William E. Brandt. *Automatic Machining*, v. 18, Sept. 1957, p. 51-55.

Tumbling procedures. Principal variables are volume of barrel compartment, r.p.m., percentage of compartment volume occupied by load, tumbling time, chips or chip mixture, amount and type of compound, and water level.

18091* (German.) Treatment of Metal Surfaces Before Finishing. **Vorbehandlung von Metalloberflächen für eine nachfolgende Lackierung.** H. Kohlhase. *Feingerätetechnik*, v. 6, Aug. 1957, p. 371-375.

Cleaning metal surface from rust, scale, oil, grease, dust, etc. Roughness and varnish adhesion. Protection against corrosion. Chemical and mechanical cleaning and passivation. Use of grease solvents. Inorganic cleaners.

18092 Solvent Degreasing—A Valuable Industrial Process. W. L. McCracken. *Iron and Steel Engineer*, v. 34, Aug. 1957, p. 73-80.

Degreasing solvent; development and growth; solvent degreasing cycles; design considerations; operation and maintenance; economic considerations.

18093 Selecting Mechanical Finishes for Stainless Steel. Richard E. Paret. *Materials in Design Engineering*, v. 46, Sept. 1957, p. 110-114.

Tables show available mill finishes, how to obtain a no. 4 finish, how to develop a higher finish than no. 4, and how to get smooth bright, semibright, or textured finishes.

18094 Barrel Finishing. II. Arthur S. Kohler. *Metal Finishing*, v. 55, Sept. 1957, p. 59-63.

Barrel construction and lining; auxiliary barrel equipment; tumbling media; composition of media; compounds used in barrel finishing. (To be concluded.)

18095 Color and Textures for Aluminum. R. V. Vanden Berg. *Product Engineering*, v. 28, Sept. 30, 1957, p. 101-108.

Exceptional range of surface treatments—mechanical, chemical, and electrochemical—plus some coloring methods peculiar to this metal provide wide scope for attractive product identification.

See also: **18240** (structure of polished surfaces); **18518** (regeneration of pickling wastes); **18544** (pickling exhaust ventilation).

METALS—FOUNDRY PRACTICE

18096* (Portuguese.) Molding Sands Agglomerated by Means of Sodium Silicate and Carbon Dioxide Gas. **Areias de fundição aglomeradas por silicato de sódio e gás carbônico.** Victor Lo Ré. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Apr. 1957, p. 129-137.

Effects of moisture, mixing time, amount of sodium silicate, and time of CO_2 introduction on mold permeability and hardness and on tensile strength of the casting. Asphalt addition makes stripping easier.

18097* Application of Sodium Silicates for Bonding Sands. F. W. Nield and D. Epstein. *British Foundryman*, v. 50, pt. 9, Sept. 1957, p. 457-465.

Four sodium silicates of SiO_2/Na_2O ratio 2·0, 2·5, 2·9, and 3·3 were investigated.

18098 Reactions Between Some Magnesium Alloys and Liquid Cast Iron. U. Zwicker. *Henry Brutcher Translation No.* 3972, 12 p. (From *Zeitschrift Metallkunde*, v. 45, no. 1, 1954, p. 31-35.) Henry Brutcher, Altadena, Calif.

Magnesium master alloys of high (Mg-Ni base) vs. low (Mg-Si-Fe base) specific gravity for use in production of ductile iron. Equilibrium studies of difference in reaction mechanism between the incorporation of 15% Mg-Ni alloys and 40% Mg, 53% Si, 7% Fe alloys into molten cast iron. New data on the quaternary systems Fe-Ni-C-Mg and Fe-Si-C-Mg; compounds showing the highest stability in the two systems.

18099 Use of Waterglass-Molding Sand Mixes Without Carbon Dioxide Hardening for Gray-Iron and Steel Casting. A. Gebauer and O. Gerstmann. *Henry Brutcher Translation No.* 4008, 12 p. (From *Giessereitechnik*, v. 3, no. 4, 1957, p. 73-77.) Henry Brutcher, Altadena, Calif.

Applications in which waterglass-bonded molding sands perform better without than with subsequent CO_2 hardening, making it possible to remove the pattern from the still plastic mold and ensuring a good green strength of the molding sand.

18100* (Russian.) Sealing of Defects in Cast Iron With Carbinol. **Ustranenie defektov v chugunnom lit'e pri pomoshchi karbinol'nogo kleia.** M. Z. Libenshtein. *Energetik*, v. 5, no. 8, Aug. 1957, p. 20.

Preparation and application of carbinol paste.

18101 New Processes Used at New Investment Casting Foundry. Edwin Bremer. *Foundry*, v. 85, Oct. 1957, p. 94-99.

New foundry incorporates the latest advances in equipment, material handling, mold preparation and investment, and controls.

18102 Molding With CO_2. Leonard Romano and Anton Dorfmueller, Jr. *Foundry*, v. 85, Oct. 1957, p. 104-107.

Some recommended sand mixtures and proven operating experiences for use in making CO_2 molds.

18103 Measurement of Casting Surface Roughness. C. H. Good and C. E. McQuiston. *Foundry*, v. 85, Oct. 1957, p. 116-120.

Suggested definitions for casting finishes and several possible means for measuring surface roughness.

18104 Brass Foundry Salvage Practice. Harry St. John. *Foundry*, v. 85, Oct. 1957, p. 121-123.

Segregation of alloys, reclamation processes, and refining.

18105 Protection and Preparation of Casting Surfaces. Van der Bruggen. *Foundry Trade Journal*, v. 103, Sept. 12, 1957, p. 315-318.

Nature and causes of surface contamination; remedial measures.

18106* (Russian.) The Problem of Theory and Practice in Centrifugal Casting. **K voprosu o teorii i praktike tsentrobezhnogo sposoba lit'ia.** B. I. Loshkarev. *Liteinoe Proizvodstvo*, 1957, no. 8, Aug., p. 1-6.

Too-fast rotation of the mold results in concentric laminations caused by liquation planes in the casting.

18107* (Russian.) A Method for Computing the Cooling of Girder-Type Castings in Sand Molds. **Metod rascheta ostyvaniia otlivok balochnogo tipa v peschanoi forme.** O. Iu. Kotsiubinskii. *Liteinoe Proizvodstvo*, 1957, no. 8, Aug., p. 19-22.

A method for computing temperature fields by using indexes of relative heat emission makes it possible to follow the cooling process of both the individual casting elements and the casting as a whole.

18108 (Russian.) Effect of Nitrogen on the Structure and Mechanical Properties of Gray Iron. **Vliianie azota na strukturu i mekhanicheskie svoistva serogo chuguna.** B. V. Bauman. *Liteinoe Proizvodstvo*, 1957, no. 8, Aug., p. 24-26.

Various methods of N treatment of gray iron and determination of effects of N on its structure and mechanical properties. Results show that the nitrogen treatment increases the mechanical properties of gray iron.

18109 The Manufacture and Application of Large Aluminium Pressure Die Castings. A. F. Bauer. *Machinery (London)*, v. 91, Aug. 30, 1957, p. 491-502.

Reviews progress in the U. S. with specific reference to the design of large dies and the materials employed, design of large components for pressure die casting, and the testing of large castings.

18110 Magnesium Casting Technology. A. W. Brace and F. A. Allen. 174 p. 1957. Reinhold Publishing Corp., New York. (TS630 B72m)

An account of the theory underlying production operations, plus practical working details.

18111 Design of Die-Castings. III. Mechanical Factors Affecting Component Design. H. K. Barton. *Metal Industry*, v. 91, Sept. 13, 1957, p. 213-215.

18112* (Czech.) Automatic Production of Shell Molds. **Automat na výrobu skořepinových forem.** Jiří Březina. *Slévárenství*, v. 5, no. 8, Aug. 1957, p. 232-236.

Machine allows economical production of shell molds for intricate castings.

18113* (Czech.) Production of Flaskless Molds From Chemically Hardened Sands. **Výroba bezrámových forem z chemicky tvrzených písků.** Miroslav Bednářik and Maximilian Vana. *Slévárenství*, v. 5, no. 8, Aug. 1957, p. 237-240.

Production by means of a jig. The strength of chemically hardened molds made possible the use of the stack method of casting, and a decrease in labor and sand consumption.

See also: **18063** (continuous-casting machine); **18547** (foundry dust control).

METALS—HEAT TREATMENT

18114* Tool Heat Treatment Techniques. L. Sinclair. *Australasian Engineer*, v. 50, July 1957, p. 69-74.

Martempering; TTT curves; quenching media; straightening; die casting dies.

18115* Heat Treatment of Welding Joints. K. Frauenfelder. *Brown Boveri Review*, v. 44, June-July 1957, p. 290-294.

Purpose is to prevent formation of hard zones from which flaws later develop and to relieve internal stresses.

18116 Sintin—A New and Efficient Agent for Gas Carburizing. A. T. Kalinin, M. N. Kuniavskii, and A. Ia. Zaitseva. *Henry Brutcher Translation No.* 3975, 19 p. (From *Metallovedenie i Obrabotka Metallov*, 1956, no. 11, Nov., p. 40-49.) Henry Brutcher, Altadena, Calif.

Sintin is of uniform composition, contains no naphthenes aromatics, sulfur, or asphaltenes, unlike natural petroleum products. It forms ½-⅓rd the quantity of soot and coke, and 1½-2 times as much gas, carburizes in holding furnaces at 25-35% higher rate than the kerosene normally used, and causes no corrosion of parts or furnace equipment.

18117* (German.) Hardening in the Most Economical Way With New Electrical Furnaces. **Wirtschaftlich Härten mit neuen Elektroöfen.** Th. Türk. *Elektrowärme*, v. 15, July 1957, p. 260-268.

Deals in detail with pot furnaces and push-through furnaces for carburizing and carbo-nitriding in gaseous atmospheres.

18118 Why Not Direct Quench? T. W. Ruffle. *Iron & Steel*, v. 30, Sept. 1957, p. 441-444.

Direct quenching from carburizing requires suitable steel, careful control, and proper equipment, but its economic advantage makes it economically practical, particularly for components such as spiral bevel and hypoid gears, where control of movement in case hardening is of major importance.

18119 Bright Heat Treating the Nonferrous Alloys. Clarence E. Peck. *Metal Progress*, v. 72, Sept. 1957, p. 70-75.

Atmospheres are specified for successful bright annealing of the principal non-ferrous metals and their alloys, to avoid dezincification of brasses, and to protect powder metal compounds during sintering, or combinations during furnace brazing.

18120 Relief of Residual Grinding Stresses by Annealing. H. R. Letner and A. B. Sauvageot. *Metal Progress*, v. 72, Sept. 1957, p. 79-82.

Momentary heating of the surface (no more than 90 sec. in a salt bath) at 650 F will relieve 80% of the internal stresses left by grinding. If softening of more than one point on the Rockwell scale is prohibited, 90 sec. at 500 to 600 F will remove about half the surface stresses.

18121 Multi-Purpose Heat Treat. E. A. Schoeffer. *Metal Progress*, v. 72, Sept. 1957, p. 83-87.

Two in-and-out batch-type carbo-nitriding furnaces, a washing machine, unique arrangements of roller conveyers, and extensive use of high-alloy castings form a combination suitable for hardening small parts made of various types of steel and cast iron.

18122* (Russian.) Magnetic Investigation of Tempering of Nitrided Iron and Steel. **Magnitnoe issledovanie otpuska azotirovannogo zheleza i stali.** V. G. Permiakov. *Metallovedenie i Obrabotka Metallov*, 1957, no. 8, Aug., p. 15-16.

Attempt to compare processes of tempering of carbon steel with tempering of nitrided hardened iron and nitrided steel using the magnetic method. The analogy of these processes is confirmed experimentally. Irreversible magnetic changes taking place at 300-550 C are explained on the basis of nitride and carbo-nitride transformation, a phenomena similar to one taking place in the case of hardened C steel.

18123 Diffusion-Limited Annealing of Radiation Damage in Germanium. T. R. Waite. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 471-478.

Experimental procedure and results; microscopic description of samples; mathematical formulation; rate equation; treatment of the data.

18124* (German.) Flame-Hardening of Build-Up Welds. **Flammenhärten von Auftragsschweissungen.** Valentin Trunschitz. *Schweisstechnik*, v. 11, July 1957, p. 80-84.

Structural changes by normal slow heating and cooling of steel. Flame hardening as a surface treatment process. Choice of fuel gas. Hardening of locomotive wheel rims.

18125* (Russian.) The Elimination of Local Brittleness in Technical Iron Plates. **Prichina mestnoi khrupkosti v listovom tekhnicheskom zheleze i sposoby ee ustraneniia.** M. V. Pridantsev and E. V. Smirnov. *Stal'*, v. 17, no. 8, Aug. 1957, p. 736-740.

For elimination of local brittleness which originates after annealing owing to the increase of O content, it is expedient to anneal at 900-950 C in a dry atmosphere (in H or in dissociated ammonia).

18126 Austempering Is Mechanized. R. S. McFall and C. A. McFadden. *Steel*, v. 141, Sept. 23, 1957, p. 125-126.

An automatic machine heats, quenches, washes, and dries typewriter part automatically.

18127* (Russian.) Thermal Calculations for Induction Surface Heating. **Teplovye raschety pri poverkhnostnom induktsionnom nagreve.** A. V. Donskoi and P. V. Firsov. *Vestnik Mashinostroeniia*, v. 37, no. 8, Aug. 1957, p. 65-70.

Theoretical and experimental determination of temperature fields and speeds of thermal processes in induction heating. Approximate rates of distribution of thermal waves in steel and basic laws for heating were determined and expressed in formulas.

See also: **17923** (control of atmosphere generators); **18135** (heat treatment of spheroidal iron); **18164** (heat treatment of permanent magnet alloys); **18186** (heat treatment of uranium alloys); **18233** (heat treatment of pure Fe); **18280** (heat treatment of radioactive materials).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

18128 (English.) **Statistical Thermodynamics of Liquid Metallic Solutions.** Mitsuo Shimoji and Kichizo Niwa. *Acta Metallurgica*, v. 5, Sept. 1957, p. 496-501.

A cell model with a generalized potential field is applied to the liquid metallic solutions, since the interatomic energy in liquid metal does not obey the inverse sixth-power law. First, a model of a rigid sphere with attractive force is used, and second, a model of repulsive and attractive forces which is assumed to be Morse type. The bond energy between unlike atoms is explained in terms of the electro-negativities. Calculations show that the excess quantity depends upon the differences of the electro-negativities and of the interaction energies of pure liquid metals, as well as upon the disparity of atomic radii. Some comparisons with other theories of liquid metallic solution are offered.

18129 (English.) **Anomalous Behaviour of Ag-Pd Alloys on Plastic Deformation.** W. H. Aarts and A. S. Houston-MacMillan. *Acta Metallurgica*, v. 5, Sept. 1957, p. 525-527.

When plastically deformed at the N point certain alloys showed a decrease of resistivity. For a 10% deformation the greatest reduction in resistivity occurred for an alloy of 60% Ag-40% Pd.

18130* (German.) Twin Formation and Brittle Fracture Tendency in Steels. **Zwillingsbildung und Sprödbruchneigung von Stählen.** Albert Kochendörfer and Herbert Scholl. *Archiv für das Eisenhüttenwesen*, v. 28, Aug. 1957, p. 483-488.

The optical and electron microscopes were used to study the possible twin formations appearing in rimmed Thomas and open-hearth steels, as a function of the multiple axes in the state of stress and the temperature.

18131 Special Techniques for Increasing Strength and Fatigue Life of Steel Stressed in Torsion. N. E. Hendrickson. *ASTM Bulletin*, 1957, no. 224, Sept., p. TP160-TP162.

Shot peening and presetting make it possible for 40 lb. of steel in torsion bar springs to do a job that would otherwise require almost twice as much material.

18132* (Russian.) Residual Stress and the Hardness of Engine Parts. **Ostatochnye napriazheniia i tverdost' detalei dvigatelei.** I. A. Mishin. *Avtomobil'naia i Traktornaia Promyshlennost'* 1957, no. 7, July, p. 22-24.

Because of crystallite and other elementary deformations within the atom crystal lattice that occur while the engine is running, a further hardening of metal takes place, and the residual compressive stress increases at the same time.

18133 Behaviour of Metals at Elevated Temperatures. 122 p. 1957. Philosophical Library, New York. (TA460 In7b)

Engineering properties of metals at high temperatures. Effect of temperatures up to 450 C, with particular reference to airframe structures and guided missiles. Non-ferrous high temperature materials; high temperature steels.

18134* Properties Revealed by Tensile Tests on Pearlitic Nodular Irons. G. N. J. Gilbert and K. B. Palmer. *British Foundryman*, v. 50, pt. 9, Sept. 1957, p. 441-457.

Shows that a trace of As or P above about 0.05% is sufficient to produce superior high-temperature properties. At room temperature these elements tend to embrittle.

18135* The Influence of Heat-Treatment Upon the Impact Properties of Spheroidal Graphite Cast Iron. J. H. Gittus. *British Foundryman*, v. 50, pt. 9, Sept. 1957, p. 466-474.

18136 Reagents for Evaluating Susceptibility to Temper Brittleness in Steel. F. M. del Corral and J. M B. de Castro y Mosquera. *Henry Brutcher Translation No.* 3878, 7 p. (From *Instituto del Hierro y del Acero,* v. 9, no. 45, Apr. 1956, p. 478-480.) Henry Brutcher, Altadena, Calif.

Various reagents proposed for demonstrating temper brittleness metallographically were tested. The use of ethereal solutions of picric acid containing Zephirol or of alkaline potassium permanganate (dark-field illumination) shows a satisfactory correlation between the impact values and the microscopic appearance of the samples.

18137 Position of the Cold-Shortness Threshold in Temper Embrittlement. V. I. Prosvirin and E. I. Kvashnina. *Henry Brutcher Translation No.* 3911, 6 p. (From *Metallovedenie i Obrabotka Metallov,* no. 3, Mar. 1955, p. 17-20.) Henry Brutcher, Altadena, Calif.

Effects of grain size and duration of tempering on ductile-to-brittle transition temperature of low-alloy steels. Demonstration that this temperature is a reliable criterion of tendency to temper brittleness.

18138 New Approach to the Thermodynamics and Calorimetry of Alloys. Their Application to Iron and Steel. W. Oelsen and E. Schurmann. *Henry Brutcher Translation No.* 3993, 18 p. (From *Giesserei,* v. 44, no. 5, 1957, p. 113-120.) Henry Brutcher, Altadena, Calif.

Importance of thermodynamics in the melting and casting of metals. New calorimetric technique. Heat content curves for Fe, Fe-C, Fe-Si-C, and Fe-P-C alloys.

18139 Effect of Small Quantities of Certain Alloying Elements Upon Temper Brittleness. I. E. Kontorovich. *Henry Brutcher Translation No.* 3994, 6 p. (From *Fizika Metallov i Metallovedenie,* v. 3, no. 3, 1956, p. 553-555.) Henry Brutcher, Altadena, Calif.

Effects of Al, Be, Ti, and Cb in structural steels.

18140 Effect of Porosity Upon Properties of Sintered Powder Permanent Magnets. A. B. Al'tman. *Henry Brutcher Translation No.* 3996, 9 p. (From *Fizika Metallov i Metallovedenie,* v. 4, no. 1, 1957, p. 84-88.) Henry Brutcher, Altadena, Calif.

Establishment of a correlation between maximum magnetic energy, residual energy, and residual induction, on the one hand, and pore volume, on the other. Development of empirical formulas for calculation of residual induction and maximum magnetic energy of porous permanent magnets.

18141 The Freezing Points of High Purity Metals as Precision Temperature Standards. II. An Investigation of the Freezing Temperatures of Zinc, Cadmium, and Tin. E. H. McLaren. *Canadian Journal of Physics,* v. 35, Sept. 1957, p. 1086-1106.

18142* (Russian.) Effect of Pressure on the Galvanomagnetic Properties of Bi. **Vliianie davleniia na gal'vanomagnitnye svoistva vismuta.** N. E. Alekseevskii, N. B. Brandt, and T. I. Kostina. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, no. 6, June 1957, p. 790-795.

Pressure and galvanomagnetic properties of Bi, without and with concentrations of 0.03 to 0.0005% of Pb, Sn, Te, and Se. Effect of pressure on the relation between electric resistance of Bi and the temperature.

18143 On the Plane Plastic Flow of an Inset Block. E. W. Ross, Jr. *Journal of Applied Mechanics,* v. 24, Sept. 1957, p. 457-460.

The yield-point pressure is found for the plane-flow problem of a rectangular metal block, set into a rough entrenchment and squashed from above by a flat, smooth die. The pressure is a function of both the block width and depth, and for large ratios of width/depth approaches the linear pressure variation associated with the Prandtl (cycloidal) stress distribution.

18144 Plastic Deformation of Copper and Silver Whiskers. S. S. Brenner. *Journal of Applied Physics,* v. 28, Sept. 1957, p. 1023-1026.

Whiskers exhibit extremely sharp yield points and extensive easy "glide" regions which are due to the propagation of Lüders bands. It is unlikely that the sharp yield points are caused by dislocation pinning. The propagation of the Lüders bands often becomes obstructed giving rise to repeated yielding in the plastic region.

18145* Lattice & Electronic Specific Heats of Copper & Silver. K. G. Ramanathan and T. M. Srinivasan. *Journal of Scientific & Industrial Research,* v. 16, sec. B, July 1957, p. 277-279.

18146* (Russian.) Effect of Surface Condition on Tendency of 30KhGSA Steel to Delayed Fracture. **Vliianie sostoianiia poverkhnosti na sklonnost' stali 30KhGSA k zamedlennomu razrusheniiu.** T. K. Zilova, V. E. Sadovskii, and N. I. Demina. *Metallovedenie i Obrabotka Metallov,* 1957, no. 8, Aug., p. 2-7.

Effects of thermal and mechanical treatment on surface condition and mechanical properties. Tests show that the hardened surface layer (regardless of the way it is obtained) increases sensitivity to delayed fracture.

18147* (Russian.) Properties of Wrought Titanium-Aluminum Alloys at Elevated Temperatures. **Svoistva deformiruemykh splavov sistemy titan-aliuminii pri povyshennykh temperaturakh.** R. N. Nikitenko. *Metallovedenie i Obrabotka Metallov,* 1957, no. 8, Aug., p. 7-14.

Determination of mechanical properties and effect of long-time oxidation. Results of long time hardness tests at elevated temperatures. Hardness increases with Al content, the largest increase was observed between 3.5-4.5% Al. With temperature increase, the effect of increased Al content on hardness decreases. Alloying (to 7% Al) noticeably affects the hardness to 700 C.

18148* (Russian.) Effect of a Notch on Mechanical Properties of ML5 Alloy. **Vliianie nadreza na mekhanicheskie svoistva splava ML5.** N. M. Tikhova and V. A. Blokhina. *Metallovedenie i Obrabotka Metallov,* 1957, no. 8, Aug., p. 16-19.

Effect depends on testing temperature. At room temperature and 100 C, strength is lower than in smooth specimens at 150 C or higher.

18149* (Russian.) On the Connection Between Plasticity and Degree of Alloying of Solid Solutions. **O sviazi plastichnosti s legirovannost'iu tverdykh rastvorov.** A. A. Presniakov. *Metallovedenie Obrabotka Metallov,* 1957, no. 8, Aug., p. 21-24.

Data on change of plasticity with temperature in the case of steels of varying C content. The highest value of plasticity is shown by all alloys at high temperatures. The higher the degree of alloying, the greater the decrease of plasticity and the temperature at which it begins. Other factors affecting plasticity are grain size, condition of grain boundaries, and distribution of additions.

18150 The Physical Properties of Electrodeposited Metals. T. E. Such. *Metallurgia,* v. 56, Sept. 1957, p. 121-124.

Methods available for the determination of tensile strength, ductility, hardness, and internal stress.

18151* (Russian.) Thermal and Electrical Properties of Copper Alloys. **Teplovye i elektricheskie svoistva splavov medi. III.** V. E. Mikruikov. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii,* v. 12, no. 2, 1957, p. 85-93.

Effect of soluble metallic additions of various elements. Measurements to determine the dependence of heat conductivity, electrical resistance, and Widman-Franz correlation of various Cu alloys on temperature. Possibility for calculation of heat conductivity for any Cu alloy in a broad temperature range according to the experimental value of dependence of electrical conductivity on temperature.

18152 The Flow Stress of Polycrystalline Aluminium. C. J. Ball. *Philosophical Magazine,* v. 2, ser. 8, Aug. 1957, p. 1011-1017.

Shows that there is a strong correlation between flow stress and subgrain size in polycrystalline aluminum deformed in tension; the strength of the boundaries does not appear to depend on boundary angle. The variation of flow stress with temperature suggests that the strength controlling factor is elastic interaction.

18153 The Velocity of Sound in Metals at High Temperatures. J. F. W. Bell. *Philosophical Magazine,* v. 2, ser. 8, Sept. 1957, p. 1113-1120.

A pulse method of measuring the velocity of sound in thin rods over a wide temperature range, in some cases to the melting point, was developed. Measurements on Al, brass, Ni, Fe, Pb, solder, and Tl show that, in the strain free condition, the method is a sensitive indication of physical and structural changes.

18154 Anomalous Electrical Resistivity and Magnetoresistance Due to an *s-d* Interaction in Cu-Mn Alloys. Kei Yosida. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 396-403.

Experimental results indicate that alloys with several at.% Mn show an abrupt decrease in resistivity at low temperature, and as the concentration of Mn ions becomes lower the resistivity initially rises and then decreases, exhibiting a maximum value with lowering temperature.

18155 Electrical Properties of Tellurium at the Melting Point and in the Liquid State. A. S. Epstein, H. Fritzsche, and K. Lark-Horovitz. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 412-419.

Results indicate that semiconducting properties persist in the liquid state and that a gradual transition to metallic conduction takes place at higher temperatures.

18156 Electrical Properties of Boron Single Crystals. William C. Shaw, D. E. Hudson, and G. C. Danielson. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 419-427.

Electrical resistivity, Hall coefficient, and thermoelectric power of microscopic crystals were measured as a function of temperature. Rectification and photoconductivity effects were observed at room temperature.

18157 Thermal Conductivity of Indium Antimonide. Audrey D. Stuckes. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 427-428.

Measurements were made in the 40 to 425 C range. Electronic component of the conductivity was calculated. The lattice thermal conductivity was deduced. Indium antimonide appears to behave according to conventional theory.

18158 Heat Capacity of Palladium Below 4.2 K. John A. Rayne. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 669-670.

18159 Low-Temperature Galvanomagnetic Effects in Bismuth Monocrystals. R. A. Connell and J. A. Marcus. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 940-946.

Measurements of the Hall coefficient and magnetoresistance were made at liquid He temperatures in the range from 3 to 16 kilogauss for all principal crystallographic orientations.

18160 Elastic Constants of Magnesium From 4.2 K to 300 K. L. J. Slutsky and C. W. Garland. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 972-976.

18161 Oscillatory Galvanomagnetic Properties of Bismuth Single Crystals in Longitudinal Magnetic Fields. Julius Babiskin. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 981-992.

Studied in fields up to 60,000 gauss at liquid He temperatures.

18162* (English.) **The Magnetic Properties of Iron Selenide Single Crystals.** Kinshiro Hirakawa. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 929-938.

The obtained saturation magnetizations for Fe_7Se_8 and Fe_3Se_4 are respectively 68 and 80 gauss at the liquid air temperature.

18163* (English.) **The Magnetic Aging of Commercial Pure Iron.** Mitsuru Asanuma and Shinji Ogawa. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 955-958.

Magnetic aging is due to the presence of very small amounts of C and N.

18164 Processes Occurring During the Heat Treatment of Alcomax. A. G. Clegg and M. McCaig. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 817-822.

Concludes that maxima in the coercivity curves are associated with subsidiary Curie points.

18165 The Unusual Magnetic Properties of Quenched Alcomax III. M. McCaig. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 823-826.

Quenching from a high temperature creates a permeability almost constant up to flux densities of over 5000 gauss and a ratio of remanence to saturation intensity of less than 0.1.

18166 The Temperature Coefficient of Reflectivity of Nickel. L. Ward. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 862-866.

The variation with temperature of the reflecting power of nickel was measured at 5 wavelengths. There is no conclusive evidence for a significant change in reflectivity at the Curie point.

18167* **The Effect of Surface Treatment on the Mechanical Properties of Tungsten.** K. Sedlatschek and D. A. Thomas. *Powder Metallurgy Bulletin*, v. 8, June 1957, p. 35-40.

Measurements of transverse-rupture strength, deflection, tensile strength, and elongation on surface-treated W rods showed that the mechanical properties of the W rods can be improved by electropolishing.

18168 (German.) Detecting the Risk of Brittle Fracture by Means of the Notched Bar Impact Test. **Der Kerbzerreissversuch und seine Anwendung zur Ermittlung der Sprödbruchgefahr. I.** H. Flössner and K. Matthaes. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, no. 8, Aug. 1957, p. 249-258.

Temperature, speed of impact, and local tension were studied after describing the best method to determine brittle fracture in different steels. It is a construction problem as well as a question of material resistance.

18169* (English.) **Magnetization, Magnetostriction and Relaxation Phenomena During Isothermal Magnetic Annealing at High Temperatures in Ni-Co Alloys.** Hakaru Masumoto, Hideo Saitô, and Minoru Takahashi. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Aug. 1957, p. 293-308.

An apparatus for the precise measurement of magnetostriction and magnetization at high temperatures was constructed. Magnetic properties of Ni-Co alloys were measured.

18170 New Steel for Hot Aircraft. *Steel*, v. 141, Sept. 23, 1957, p. 138-139.

Properties of Armco PH 15-7 Mo steel which can be used up to 1000 F.

18171 How to Avoid Cracking Die Steels. I. *Steel*, v. 141, Sept. 30, 1957, p. 79-82.

Some rules for correct design and machining.

18172 Tensile Properties of Inconel X Sheet Under Rapid-Heating and Constant-Temperature Conditions. Ivo M. Kurg. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4065, Aug. 1957, 20 p. (TL570 Un3t)

A marked increase in strength is observed with increased temperature rates.

18173 Tensile-Stress-Strain Properties of 17-7 PH and AH 350 Stainless-Steel Sheet at Elevated Temperatures. Ivo M. Kurg. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4075, Sept. 1957, 16 p. (TL570 Un3t)

Stress-strain curves and data for yield and ultimate stresses, Young's modulus, and elongation are given in tabular and graphical form.

18174* (Russian.) Surface Phenomena Occurring in Plastic Deformation of Metals. **Poverkhnostnye iavleniia pri plasticheskoi deformatsii metallov.** A. F. Braun. *Uspekhi Fizicheskikh Nauk*, v. 62, no. 3, July 1957, p. 305-355 + 14 plates.

Discussion of theories explaining the plastic deformation of metals. Relation between internal processes in metals and deformation. Effect of surface conditions on internal processes.

18175 Arrest of Brittle Fractures in Wide Steel Plates. R. J. Mosborg, W. J. Hall, and W. H. Munse. *Welding Journal*, v. 36, Sept. 1957, p. 393s-400s.

Behavior of welded crack-arrester details which might be used under service conditions.

18176 Effect of Metallurgical Variables on Transition Behavior in Charpy Slow-Bend and Impact Tests. C. E. Hartbower. *Welding Journal*, v. 36, Sept. 1957, p. 401s-409s.

Effects of three sub-critical heat treatments involving the phenomenon of quench aging, and variations in composition by the controlled addition of C and Mn as alloying elements.

18177 Analysis of Dynamic Creep Considering Strain Rate Effects. F. H. Vitovec. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 57-104, May 1957, 16 p. (TL507 Un3.18w Vis.)

The theoretical analysis of the strain rate effects in dynamic creep conform with the experimental observation that retardation of creep increases with increasing temperature, and with increasing alternating stress frequency. Dynamic creep properties of a number of alloys are reported.

18178 Effects of Processing Variables on Fracture and Disc-Bursting Characteristics of Four High Temperature Materials. Richard Sakamoto. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 57-154, May 1957, 77 p. (TL507 Un3.18w Vis.)

Data on Timken 17-22AV, a martensitic low alloy steel; G.E. B50R311, a martensitic stainless steel; Timken 16-25-6, an austenitic, hot-cold worked alloy; and A-286, an austenitic, age-hardening alloy.

18179* (German.) Superconductivity of Evaporated Lead Layers With Addition of Manganese. **Supraleitung aufgedampfter Bleischichten mit Zusatz von Mangan.** Nikolaus Barth. *Zeitschrift für Physik*, v. 148, no. 5, 1957, p. 646-652.

Transition curves with different additions of Mn were measured. Transition temperature to super-conductivity greatly decreased by increasing Mn content. Superconductivity eliminated by addition of 0.3 at.% Mn. Effects of Mn on different superconductors.

18180* (Russian.) Investigation of Temperature Dependence of Work Function of Some Semimetals. **Issledovanie temperaturnoi zavisimosti raboty vykhoda nekotorykh polumetallov.** G. N. Lekhtinen, M. A. Rzaev, and L. S. Stil'bans. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1221-1228.

Investigation of a series of sulfides, selenides, and lead and bismuth tellurides. Results show that at temperatures lower than 150 C the absolute values and the temperature dependence of the work function are basically determined by absorbed gases and vapors. At temperatures higher than 150 C, the dependence for electron and hole-type semiconductors is different.

18181* (Russian.) Microscopic Investigation of the Growth of Cracks Caused by Rupture. **Mikroskopicheskoe izuchenie rosta treshchin pri razryve.** S. N. Zhurkov and E. E. Tomashevskii. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1248-1256.

A micro-cinematography method was used for studying kinetics of growth of cracks in thin samples. Detailed analysis was carried out on acetyl cellulose films (di- and tri-acetate), foils of polycrystal Zn and Al, and on silicate-glass plates.

18182* (Russian.) Physical Properties of Alloys and Molecular Concentration. **Fizicheskie svoistva splavov i molekuliarnaia kontsentratsiia.** P. A. Savintsev. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1257-1260.

Many physical properties of crystals vary with molecular concentration. Hence, on this basis, the properties of alloys can be estimated.

See also: **17679** (properties of anodized Al alloys); **17736** (Hall effect in Fe-Mo alloys); **17766** (properties of InSb); **17916** (ultrasonic determination of Young's modulus); **17994** (bending stresses in Al alloys); **18085** (improved engineering properties of vacuum melted steels); **18108** (effect of nitrogen on properties of gray iron); **18125** (brittleness of iron plates); **18226** (slip lines in α-iron); **18254** (magnetic domains in Co); **18255** (deformation twinning); **18256** (fatigue of Al alloys); **18258** (strength of Cu alloys); **18272** (strength of crankshafts); **18422** (fine-particle magnets); **18425** (microscopy of magnetic domains); **18625** (cracking of welds); **18626** (strength of brazed joints).

METALS—MECHANICAL WORKING

18183 Ceramics Cut HSS and Show Their Weaknesses. John F. McAuliffe. *American Machinist*, v. 101, Sept. 9, 1957, p. 130-133.

Use of ceramic cutting tools on high-speed steel, superalloys, and Ti. Negative rake angles and low feed rates are essential with present types available.

18184 1958 Production Planbook and Buyers' Guide Issue. *American Machinist*, v. 101, Mid-Sept. 1957, sections individually paged.

Includes important facts taken from the past year's metalworking literature with references given. Predictions for the industry in 1958 are made.

18185* Stainless Steel. V. Turning, Cutting-Off, Forming Boring, and Cutting Oils. J. A. Ferree. *Automatic Machining*, v. 18, Sept. 1957, p. 60-64.

18186 The Fabrication of Uranium and Its Alloys. E. C. W. Perryman. *Canadian Mining and Metallurgical Bulletin*, v. 50, Sept. 1957, p. 574-579.

Casting, rolling, extrusion, heat treating, and miscellaneous fabrication techniques.

18187* (Russian.) Laws Governing the Drawing of Metals in the Presence of Lubricants. **O zakonomernostiakh volocheniia metallov v prisutstvii smazok.** S. Ia. Veiler and V. I. Likhtman. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1224-1227.

Friction and drawing of metals. Use of lubricants. Formulas and methods of calculation.

18188 An Appraisal of Ceramic Cutting Tools. R. C. Brewer. *Engineers' Digest*, v. 18, no. 9, Sept. 1957, p. 381 + 6 pages.

Porosity and garin size; use of alumina-based materials for practical tools; wear resistance; tool life; power requirements; surface roughness.

18189 Aluminum Cans? Here's What's Cooking. Robert J. Kelsey. *Food Engineering*, v. 29, Sept. 1957, p. 106-108.

Recent improvements in Al can muanufacture.

18190 New Method Cuts Cost of Short Run Stamping. *Iron Age*, v. 180, Oct. 3, 1957, p. 93-95.

Requiring special fixtures and a separate punching operation on each hole, actual production costs more than with regular tooling, but final cost per piece runs much less.

18191* (English.) **Study on Shave-Tuning. Cutting With Inclined Straight Edged Tool.** Masao Kubota, Tamehiro Kotorii, and Minori Kanai. *Journal of Mechanical Laboratory (Japan)*, v. 3, no. 1, 1957, p. 24-32.

New tool has a straight edge, tangential to the cylindrical surface to be finished and inclined to the direction of feed.

18192* On the Multiple Hole Extrusion of Sheets of Equal Thickness. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids*, v. 5, no. 4, 1957, p. 267-280.

Slip-line fields are proposed and pressures are calculated for the extrusion of pure Pb, tellurium Pb, and pure Sn sheet through a square die containing one, two, or three orifices, when the container walls are perfectly smooth or rough.

18193* The Cold Extrusion of Circular Rods Through Square Multiple Hole Dies. L. C. Dodeja and W. Johnson. *Journal of the Mechanics and Physics of Solids*, v. 5, no. 4, 1957, p. 281-295 + 5 plates.

Determination of pressure necessary to cold extrude pure Pb, tellurium Pb, pure Sn, and super-pure Al through 90° dies containing up to four holes arranged in different patterns.

18194 Advantages and Limitations of Ultrasonic Machining. E. A. Neppiras and R. D. Foskett. *Machine Design*, v. 29, Sept. 5, 1957, p. 121 + 2 pages.

Factors include tool material, shape, area, depth of cut, physical properties of work material, and abrasive properties including hardness, grain dimensions, nature of the suspension medium, and concentration of suspension.

18195 Developments in Aluminium Extrusion Techniques. *Machinery (London)*, v. 91, Aug. 30, 1957, p. 485-488.

Methods and equipment used in light press-plant.

18196 Hot Forming Operations on Titanium. E. A. Wooden and T. P. Iodice. *Machinery (London)*, v. 91, Sept. 13, 1957, p. 637-641.

The key to successful processing is controlled heating to temperatures ranging from 300 to 1,400 F, depending on the shape of the finished workpiece and the forming method employed. Hot stretch-wrap and resistance-heated drop-hammer forming procedures are described.

18197 Machining Titanium. II. M. C. Shaw, P. A. Smith, B. Colding, and N. H. Cook. 100 p. 1957. Massachusetts Institute of Technology, Cambridge, Mass. (TN799.T5 M38.5ma Over.)

The machining characteristics of clamped carbide tools when machining Ti alloys and AISI 4340 steel are compared. A hard finishing grade cast iron type carbide was found to be superior in machining Ti provided it did not chip. A nose radius of 1/32-in. gave best results.

18198* (Russian.) Prevention of Surface Defects on Sheets. **Bor'ba s poverkhnostnymi defektami na listakh.** A. S. Babii, and G. Z. Shcherbina. *Metallurg*, 1957, no. 9, Sept., p. 21-23.

Determination of a relationship between certain surface defects of the ingots (scabs, blisters, sand holes, slag inclusions) and defects of the sheet. Effect of heating method and sheet thickness on quality of the sheet steel. Rolling ingots with no surface defects produces sheets with clean surfaces. A careful removal of defects from the ingot surface improves sheet surface.

18199 Extrusion of a Complex Shape Through a Round Die. William E. Ray. *Metal Progress*, v. 72, Sept. 1957, p. 65-69.

A long, straight control rod of Y-shaped cross section for a nuclear reactor is made by canning flat cermet compacts, assembling them with appropriate inserts of soft steel to fill a sealed sheath, hot extruding the combination, and then dissolving the soft steel inserts in acid, leaving behind the required stainless-clad rod.

18200 Scrap in Deep Drawing Reduced 90%. C. Kenneth Divers. *Metal Progress*, v. 72, Sept. 1957, p. 88-91.

Manufacture of wheel disks and hub caps of brass, stainless, and steel strip with minimum press-room scrap was correlated with preliminary tests on Olsen cup tester. Criteria are load to produce necking and corresponding height of cup.

18201* What Angles Are Best for Ceramic Tools? H. J. Siekmann and L. A. Sowinski. *Metalworking Production*, v. 101, Sept. 6, 1957, p. 1573-1575.

Detailed results of tests run to determine how important tool geometry is to ceramic cutting materials.

18202* Dewalt's New System Takes the Guesswork Out of Sawing Aluminum. Oscar H. Nuss. *Modern Metals*, v. 13, Sept. 1957, p. 46 + 5 pages.

Proper blade size, feed rate, horsepower, and cutting position are quickly and easily determined for high speed sawing of any Al alloy.

18203* Magnesium Alloy Sheet. F. L. Coenen. *Modern Metals*, v. 13, Sept. 1957, p. 88 + 1 page.

Basic considerations for the fabrication of Mg alloy FS-1 using normal metalworking equipment.

18204* (Russian.) Punching of Small Over-All Size Keys. **Shtampovko malogabaritnykh shponok.** D. A. Vaintraub. *Priborostroenie*, 1957, no. 7, July, p. 27.

Design and operation of puch press for small keys. Durability of this punch press is quite satisfactory for mass production (approximately 10,000 punches without regrinding of dies).

18205 (German.) Effect of Microstructure on the Machinability of Structural Steels. **Einfluss des Gefüges auf die Zerespanbarkeit von Baustählen.** W. Knorr. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, no. 8, Aug. 1957, p. 258-266.

A study of machinability in low carbon steels, case-hardening steels, Mn-Cr steels, Mo-alloyed carburizing steels, Cr-Ni case-hardening steels, and heat-treatable steels; transformation curves and thermal treatment.

18206 Some Problems Involved in the Production of Aluminium Sheet in Intermediate Tempers. T. R. G. Williams and T. I. Jones. *Sheet Metal Industries*, v. 34, Sept. 1957, p. 643 + 6 pages.

The temper rolling and temper annealing methods are compared.

18207* (Russian.) Electro-Contact Treatment of Metals. **Elektrokontaktnaia obrabotka metallov.** A. S. Davydov. *Stanki i Instrument*, v. 28, no. 7, July 1957, p. 6-9.

Classification of methods of electric treatment according to the character of effect of current on the treated part, and to the type of energy immediately determining the removal of metal. Covers four types of electro-contact treatments and their technology.

18208* (Russian.) Effect of Hardness and Microstructure on the Machinability of High-Strength Cast Iron. **Vliianie tverdosti i mikrostruktury vysokoprochnogo chuguna na ego obrabatyvaemost'.** N. P. Golubov. *Stanki i Instrument*, v. 28, no. 7, July 1957, p. 22.

The hardness vs. cutting speed and cutter durability vs. cutting speed curves are plotted logarithmically.

18209* (Russian.) Straightening With Flame. **Pravka plamenem.** V. Vrzal. *Stanki i Instrument*, v. 28, no. 7, July 1957, p. 23-25 + 2 plates.

The simple method of local rapid heating permits modification of the shape of the part, but at the same time produces complicated processes, the effect of which can be objectionable.

18210 How to Get More From Machine Tools. *Steel*, v. 141, Sept. 23, 1957, p. S1-S6.

Color photos illustrate chip analysis for maximum efficiency.

18211 The Fundamentals and Application of Form and Thread Rolling. A Cold Forging Technique. II. Clifford T. Appleton. *Steel Processing and Conversion*, v. 43, Sept. 1957, p. 498 + 6 pages.

18212* (Russian.) Changes of Composition and Structure of Structural Steel in the Zone of Oxygen Cutting. **Izmenenie sostava i struktury konstruktsionnoi stali v zone kislorodnogo reza.** O. Sh. Spektor. *Svarochnoe Proizvodstvo*, 1957, no. 8, Aug., p. 18-21.

Study of changes with O cutting. Suggested methods of controlling carburization and hardening by use of preheating and slower rate of cooling.

18213* (Russian.) Production of Rectangular Copper Tubes in Cold Rolling Mills. **Proizvodstvo mednykh priamougol'nykh trub na stanakh kholodnoi prokatki.** B. N. Gol'dreer. *Tsvetnye Metally*, v. 30, no. 8, Aug. 1957, p. 20-26.

Method and technology of production of 2½" rectangular tubes.

18214* (Russian.) Deep Drawing of Some Metal and Alloy Sheets at Various Speeds With Preheating. **Glubokaia vytiazhka s podogrevom nekotorykh listovykh metallov i splavov pri razlichnykh skorostiakh.** N. A. Kliucharev. *Vestnik Mashinostroeniia*, v. 37, no. 8, Aug. 1957, p. 40-45.

Effetcs of preheating on drawing parameters and quality of products.

18215* (Russian.) Effect of Properties of Soft Sheet Steel on Durability of Drawing Dies. **Vliianie svoistv miagkoi listovoi stali na stoikost' vytiazhnykh shtampov.** P. G. Kovtun. *Vestnik Mashinostroeniia*, v. 37, no. 8, Aug. 1957, p. 46-47.

Determination of factors affecting life of drawing dies. A decrease in C content of the steel (caused by decarburizing of the surface of the sheets during annealing) and a decrease in the size of the ferrite grains resulted in a decrease in durability of the dies.

18216* (Russian.) Temperature and Vibrations in Metal Machining. **Temperatura i vibratsii pri rezanii metallov.** B. Ia. Borisov. *Vestnik Mashinostroeniia*, v. 37, no. 9, Sept. 1957, p. 40-42.

Describes a simple thermo-electric method for investigation of vibrations originating during metal machining, and derives a relation between temperature of tool cutting edge and vibration. Using this formula, the vibration can be calculated on the basis of temperature changes and vice versa. Changes of

thermo-electric power at various conditions of vibration are recorded by means of a magneto-electric oscillograph.

18217* This Thing Called Machinability. I-II. W. A. Nordhoff. *Western Machinery and Steel World*, v. 48, Aug. 1957, p. 73-76; Sept. 1957, p. 98-101.

Latest data on machinability as affected by quality and nature of cutting tools, depth of cut and feed rate, spindle speed, and microstructure of the material. Power requirements for removing a certain amount of metal.

18218* Tape-Controlled Drilling of Holes Around Circles. *Western Machinery and Steel World*, v. 48, Aug. 1957, p. 93.

18219* Shop Procedures Are Different in Research and Development Operations. R. B. Luirette. *Western Machinery and Steel World*, v. 48, Sept. 1957, p. 92-97.

Standard shop practices must be abandoned when the primary objective is production of test parts on short notice. A step-by-step pictorial case history shows procedures used by a leading research organization.

18220* (Polish.) Single-Phase Steel Forgings. **Kucie stali jednofazowych.** Mirosław Rodek. *Wiadomości Hutnicze*, v. 13, June 1957, p. 168-172.

Problems connected with the forging of austenitic and ferritic steels of different chemical compositions. Temperature range in forging stainless Cr steels. Recrystallization of 8% Ni and 18% C steels. Annealing.

18221* (Czech.) Service Experiences With Oxy-Powder Cutting. **Provozní zkušenosti s práškovým řezáním kyslíkem.** L. Killinger. *Zváranie*, v. 6, no. 7, June 1957, p. 211-218.

Describes three methods of manual and automatic cutting with siliceous or iron powders. A special flux is used for cutting rolled stainless steel. The first two methods are fast and economical, and may play an important part in production and treatment of anticorrosion steels.

See also: **17628** (numerical control of machine tools); **17633** (control of machine tools); **17652** (drives for rod mill shears); **17987** (shot peening of springs); **18120** (relief of grinding stresses); **18171** (machining of die steels); **18224** (effect of cold work on structure of Ag and Al); **18522** (treatment of rolling mill wastes).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

18222* (Portuguese.) Possible Twinning Methods in Cubic Body Centered Crystals of Martensite. **Nota sôbre os modos possíveis de maclação em cristais quadráticos de corpo centrado de martensita.** Michiyasu Doi. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Apr. 1957, p. 139-145.

A study of the substructure of martensite crystals. Starting from the Mallard law, another twin form is possible of the type $\{101\}$, $<101>$ in martensite crystals with an axial relationship of about 1.08.

18223* (Portuguese.) Microstructure of Cast Aluminum-Copper Alloys. **Estudo sôbre a micro estrutura de ligas de alumínio-cobre fundidas.** Isaac Berezin. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Apr. 1957, p. 147-163.

Survey of Al-Cu alloys used in industry; study of the constitution diagram of this binary system.

18224 (English.) **X-Ray Study of Low-Temperature Cold Work in Silver and Aluminum.** C. N. J. Wagner. *Acta Metallurgica*, v. 5, Sept. 1957, p. 477-482.

Pure Ag and Al were cold-worked by making filings under liquid N. These filings were maintained at −160 C throughout the measurements. Cold-worked Ag shows a peak-shift and an asymmetric peak broadening which can be explained by the presence of deformation stacking faults and twin stacking faults on the (111) planes. An appreciable part of the small, anisotropic particle-size broadening results directly from stacking faults. These faults anneal out in the range of 0 to 100 C. Cold-worked Al filings, even made under liquid N, show no peak-shift or asymmetry indicating that the stacking-fault density must be very low. However, there is a peak broadening indicating an appreciable particle size and strain broadening, both of which are isotropic.

18225 (English.) **A General Method for the Calculation of Madelung Constants for Intermetallic Compounds.** G. V. Raynor, P. Naor, and C. Tyzack. *Acta Metallurgica*, v. 5, Sept. 1957, p. 483-491.

18226* (German.) Effects of Crystal Orientation on the Development of Slip Lines on the Structure of α-Iron Single Crystal Specimens Subjected to a Bending Stress. **Einfluss der Kristallorientierung auf die Ausbildung von Gleitspuren an der Oberfläche biegewechselbeanspruchter α-Eisen-Einkristallproben.** Max Hempel, Albert Kochendörfer, and Emil Hillnhagen. *Archiv für das Eisenhüttenwesen*, v. 28, Aug. 1957, p. 433-444.

Metallographic examinations of α-iron single and polycrystal specimens prepared by recrystallization. Relationships between orientation and the formation of slip lines. Fractures. Fatigue cracks in crystals and boundaries.

18227* (German.) Carbides and the Holding Time in Chromium-Molybdenum-Vanadium Steels. **Die Karbide und das Zeitstandverhalten von Chrom-Molybdän-Vanadin-Stählen.** Walter Koch, Alfred Krisch, and Angelica Schrader. *Archiv für das Eisenhüttenwesen*, v. 28, Aug. 1957, p. 445-459.

The optical and electronic microscope were used to study the structures of quenched and tempered specimens of steels with about 0.18% C, 1.1 or 1.3% Cr, 1.1% Mo, and 0.35 or 0.55% V. Differences in behavior during fracture and expansion in heating tests at 500 and 550 C.

18228* (German.) Influence of Carbon Content on Austenite Decomposition and Its Reaction Products. **Einfluss des Kohlenstoffgehaltes auf den Austenitzerfall und dessen Teilreaktionen.** Werner Jellinghaus. *Archiv für das Eisenhüttenwesen*, v. 28, Aug. 1957, p. 469-481.

Kinetic examination of Mn steel with 0.16 to 1.02% C and 3.5 to 4% Mn by magnetic measurement of the amount of austenite transformed between 600 to 150 C, as a function of the transformation time.

18229 Near-Ordering of Alloys With Additional Ionic Bonds. A. G. Lesnik. *Henry Brutcher Translation No.* 3922, 20 p. (From *Problems of Metal Physics and Metallography*, no. 5, 1954, p. 104-117. Collection of papers from the metal physics laboratory of the Ukrainian Academy of Sciences.) Henry Brutcher, Altadena, Calif.

Study of the effect of near order upon the phase composition of binary alloys consisting of "donor" and "acceptor" atoms.

18230 Phase Diagram of Titanium-Iron System. I. I. Kornilov and N. G. Boriskina. *Henry Brutcher Translation No.* 3961, 6 p. (From *Doklady Akademii Nauk SSSR*, v. 108, no. 6, 1956, p. 1083-1085.) Henry Brutcher, Altadena, Calif.

Study of Ti-Fe phase diagram in fields of the compounds TiFe and $TiFe_2$; solubility limit of Ti in Fe, based on thermal, dilatometric, micrographic, and X-ray analyses, and on hardness and micro-hardness measurements.

18231 Study of Some Relationships in the Formation of Alloys of Isomorphic Borides. G. V. Samsonov and V. S. Neshpor. *Henry Brutcher Translation No.* 3997, 14 p. (From *Zhurnal Fizicheskoi Khimii*, v. 29, no. 5, 1955, p. 839-845.) Henry Brutcher, Altadena, Calif.

Investigation of some physico-chemical properties of alloys of the system TiB_2-CbB_2 and of process of mutual diffusion leading to the formation of alloys of Ti and Cb borides.

18232* (French.) Micrographic Observation of the Low Temperature Recrystallization of Aluminum Purified by the Zone Melting Method. **Sur l'observation micrographique de la recristallisation à basse température de l'aluminium purifié par la méthode de la zone fondue.** Phillippe Albert and Omourtague Dimitrov. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 681-683.

A method of electrolytic polishing and anodic oxidation of pure Al at −60 C revealed the micrographic structure of high purity Al samples recrystallized at −38 C after cold hammering by means of a rolling process with 97% reduction.

18233* (French.) Continuance of a Network of Impurities and Defects in a Pure Iron After Different Thermal Treatments in the α or γ Phase. **Sur la persistance de réseaux d'impuretés et d'imperfections dans un fer pur après divers traitements thermiques en phase α ou γ.** Pierre Coulomb. *Comptes Rendus*, v. 245, Aug. 12, 1957, p. 799-802.

Metallographic specimens revealed the pattern of old boundaries and secondary boundaries in a 99.96% Fe even after thermal treatments. Relationships between impurities and network defects.

18234* (French.) Autoradiographic Detection of Segregation of Sulfur Traces in the Boundaries of Iron Annealed in the α-Phase. **Mise en évidence par autoradiographie d'une ségrégation de traces de soufre dans les joints du fer recuit en phase α.** Claude Leymonie, Pierre Coulomb, and Paul Lacombe. *Comptes Rendus*, v. 245, Sept. 2, 1957, p. 931-934.

Detection of dotted segregation along the intergranular boundaries in pure Fe with 0.003% radioactive S supports the theory of abnormal segregation of impurities in the boundaries at temperatures higher than the limit of solubility.

18235* (French.) Selenides of Trivalent Uranium. **Sur les séléniures de l'uranium tétravalent.** Parviz Khodadad. *Comptes Rendus*, v. 245, Sept. 2, 1957, p. 934-936.

The crystalline α, β, and γ forms of Se_2U, analogous to those of S_2U, are obtained by the action of heat on Se_3U. The lowest temperature gives the γ derivative.

18236 Dislocations in Stainless Steel. W. Bollmann. Paper From "Electron Microscopy. Proceedings of the Stockholm Conference, September 1956". Academic Press. 1957. p. 316-318. (QH211 EL25)

Stacking faults and other dislocations in 18% Cr-8% Ni steel are examined by transmission electron microscopy of thin crystal foils.

18237* (Russian.) X-Ray Emission Lines of the K β-Group of Titanium in Carbides. **Rentgenovskie emissionnye linii Kβ-gruppy titana v karbidakh.** E. E. Vainshtein and Iu. N. Vasil'ev. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 741-744.

X-ray spectroscopic study of carbides, nitrides, and hydrates of the transitional metals.

18238* (Russian.) Martensite Transformation as Influenced by Bombardment With Neutrons. **Vliianie neitronnogo oblucheniia na martensitnoe prevrashchenie.** A. I. Zakharov and O. P. Maksimova. *Doklady Akademii Nauk SSSR*, v. 114, no. 6, June 21, 1957, p. 1195-1198.

Study of phase transformation under the effect of neutron bombardment on steel and alloy samples. Previously heat treated samples (annealing in vacuum at 1100 C for 10 hrs.) were subjected to bombardment in a reactor, one group for 100 hrs., and the other for 200 hrs. The total flow of neutrons was of the order of 10^{17} n/cm^2.

18239 Nucleation of Crystalline Ta_2O_5 During Field Crystallization. D. A. Vermilyea. *Electrochemical Society, Journal*, v. 104, Sept. 1957, p. 542-546.

Nucleation of amorphous Ta_2O_5 films occurs at heterogeneities on the metal surface. The time between the application of the field and the appearance of the first crystals corresponds to growth to critical size of a crystal on one of the nucleation sites. Possible mechanisms for this nucleation are discussed.

18240 A Study of the Deformed Layer Produced on Metal Surfaces by Mechanical Machining, Abrasion and Polishing Operations. L. E. Samuels. *Electroplating and Metal Finishing*, v. 10, Sept. 1957, p. 279 + 4 pages.

Metallographic structures and the depth of the deformed surface layers produced in specimens of 70:30 brass, an austenitic steel, and zinc. (To be concluded.)

18241 Variations of Transformation Characteristics Within Samples of an Alloy Steel. W. Steven and D. R. Thorneycroft. *Iron and Steel Institute, Journal*, v. 187, Sept. 1957, p. 15-32.

It is concluded from a survey of the transformation characteristics of 14-in. B.S. En 24 steel ingots, and of 2-in. square bar and 9-gage wires produced from them, that the longitudinal and transverse variations in hardenability that existed within the ingot and between the three sizes of material are due to variations in the intensity of microsegregation of the principal alloying elements Ni, Cr, Mn, and possibly of Mo and P. Hot-working operations, such as forging and rolling, only slightly reduce the intensity of microsegregation, but prolonged diffusion-annealing treatment at high temperature produces almost complete chemical homogeneity and eliminates the hardenability variations.

18242* (Russian.) Diffusion in Titanium-Niobium Alloys. **Diffuziia v splavakh titana s niobiem.** N. V. Grum-Grzhimailo. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh, Nauk*, 1957, no. 7, July, p. 24-28.

Study of the uneven processes in diffusion occurring not only on the surface of the substance but inside its crystals. Activated Ti containing radioactive Sc_{46} was used as a diffusing agent.

18243 Effect of Edge Dislocations on the Alloying of Indium to Germanium. Jacques I. Pankove. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 1054-1057.

Edge dislocations and other crystal disturbances enhance the dissolution of Ge in indium. Hence, under equilibrium conditions, deep alloying results with smaller spread of the indium than in the case where the crystal is free from these defects. The recrystallized structure over an edge dislocation differs considerably from the structure at undisturbed sites. The shape of the alloy front is determined by surface tension forces and a tendency to terminate in (111) planes.

18244* (English.) **Studies on Ball Bearing Steels. VIII. Behaviour of the Carbide in Ball Bearing Steels by Electrolytic Isolation.** Manabu Ueno and Hirooki Nakajima. *Journal of Mechanical Laboratory (Japan)*, v. 3, no. 1, 1957, p. 33-38.

The cementite in SKF bearing steels and basic electric furnace steels was isolated electrolytically. Its behavior on heat treatment was investigated, and composition of the matrix was calculated.

18245* (Russian.) Structural Characteristics of the Surface of Decarburized Castings From Wrought Iron. **Osobennosti stroeniia poverkhnosti obezuglerozhennykh otlivok iz kovkogo chuguna.** M. A. Krishtal, I. P. Fominykh, and A. Ia. Tseitlin. *Liteinoe Proizvodstvo*, 1957, no. 8, Aug., p. 22-23.

Inasmuch as the defects of graphitized cast iron are due to decarburization, decarburization should never be allowed to take place during or after graphitization. Decarburization preceding the graphitization does not affect the surface of samples.

18246* (Russian.) On the Solubility of Magnesium in Cast Iron. **K voprosu o rastvorimosti magniia v chugune.** A. F. Landa. *Liteinoe Proizvodstvo*, 1957, no. 8, Aug., p. 27-29.

Experimental study of solubility and diffusion of magnesium in cast iron. Magnesium causes formation of spheroidal graphite and increases hardness and annealing capability.

18247* (Russian.) Effect of Pre-Hardening on Rate of Diffusion of Carbon in Austenite. **Vliianie predvaritel'noi zakalki na skorost' diffuzii ugleroda v austenite.** M. A. Krishtal. *Metallovedenie i Obrabotka Metallov*, 1957, no. 8, Aug., p. 20-21.

Metallographic method of determining coefficient of diffusion of C in austenite based on a study of the decarbonization rate of white iron. Microcracks appearing after hardening (due to significant stresses associated with martensite transformation) prevent diffusion of C in austenite because of interrupted continuity and possibly because of formation of active surfaces which adsorb atoms of C. This explains why the rehardening is easier than first hardening.

18248 An Analysis of Temperature Coefficients of Solubility in Dilute Liquid Metal Solutions. S. W. Strauss, J. L. White, and B. F. Brown. *Naval Research Laboratory, Report* 4961, June 1957, 21 p. (T21 Un3.5n Contin.)

Effects of electro-negativity and relative atomic size of solvent and solute on temperature coefficients of a number of binary metal-solute/liquid-metal-solvent systems.

18249 Phase Diagram Studies of Zirconium With Silver, Indium, and Antimony. J. O. Betterton, Jr., J. H. Frye, Jr., and D. S. Easton. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2344, Aug. 1957, 52 p. (UF767 U3o Contin.)

18250 (English.) **Some Data About the System Cerium-Thorium.** J. H. N. van Vucht. *Philips Research Reports*, v. 12, Aug. 1957, p. 351-354.

Metallographic and X-ray diffraction experiments show a complete mutual solubility of Ce and Th in the face-centered cubic phase.

18251 Surface Distributions of Dislocations in Metals. II. C. J. Ball. *Philosophical Magazine*, v. 2, ser. 8, Aug. 1957, p. 977-984.

18252 Impurity-Vacancy Interaction in a Metal. L. C. R. Alfred and N. H. March. *Philosophical Magazine*, v. 2, ser. 8, Aug. 1957, p. 985-997.

Substantiates the Lazarus theory of solute diffusion in metals.

18253 Electron Microscopy of Tin Whiskers Using Carbon Replicas. D. E. Bradley, J. Franks, and P. E. Rush. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 889-892 + 2 plates.

18254 An Investigation Into the Effect of Magnetic Domains in Cobalt on an Electron Beam. M. Blackman and E. Grünbaum. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 508-521 + 2 plates.

Magnetic effects were found on the primary beam, on the diffraction pattern, on the shadow edge of the diffraction pattern, and on the shadow photograph of the crystal produced by diffuse scattering from the edge of the aperture.

18255 Deformation Twinning in the Diamond Structure. R. Bullough. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 568-577.

The theory of surface dislocation is used to calculate the most likely twinning plane.

18256 Effect of Crystal Orientation on Fatigue-Crack Initiation in Polycrystalline Aluminum Alloys. J. C. Weinberg and J. A. Bennett. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3990, Aug. 1957, 22 p. (TL570 Un3t)

Tests on large-grained specimens of 1100 and 5052 alloys indicate that fatigue cracks initiate in preexisting slipbands on planes that are parallel to (111) planes. In bending fatigue it appears that grain size and shapes as well as resolved shear stress are influential, while in torsional fatigue the resolved shear stress appeared to be the only important factor.

18257 Interdiffusion and the Vacancy Mechanism in Binary Ionic Crystals. R. F. Brebrick. *U. S. Naval Ordnance Laboratory, Navord Report* 5717, June 1957, 10 p. (TL570 Un3.55n Contin.)

The vacancy mechanism is considered for interdiffusion in a binary ionic crystal in which lattice vacancies are the predominant type of point defect and in which only the cation is mobile.

18258 Substitutional Solid Solution-Strengthening of Copper Alloys. Carl D. Wiseman, Earl R. Parker, and Thomas H. Hazlett. *University of California, Minerals Research Laboratory, Technical Report* 16, ser. 28, June 1957, 50 p. (TA21 C12.84 Contin.)

Tests indicate that solution strengthening is due to the interaction of solute atoms with the substructure in the metallic lattice.

18259* (Polish.) Tendency of the Austenitic Grain to Increase and the McQuaid-Ehna Test. **Skłonność ziarna austenitu do rozrostu i próba McQuaid-Ehna.** Antoni Kukliński. *Wiadomości Hutnicze*, v. 13, June 1957, p. 175-180.

Role of the initial grain in steel. Its tendency to growth explained. Effects on its plastic and thermal treatment. How to measure its size. Range and suitability of the McQuaid-Ehna test.

18260* (German.) X-Ray Determination of Ordering Tendencies in Binary Alloys. **Über die röntgenographische Bestimmung der Nahordnung in binären Legierungen.** A. Münster and K. Sagel. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 12, Aug. 1957, p. 145-167.

A theoretical study of diffusion of X-rays in binary alloys. Effect of temperature.

18261* (Russian.) Study of the Phase Composition, Structure and the Homogeneity Limits of Phases in the V-C-O System. **Issledovanie fazovogo sostava, stroeniia i granits gomogennosti faz sistemy vanadii-uglerod-kislorod. I.** V-C System. **Sistema vanadii-uglerod.** M. A. Gurevich and B. F. Ormont. *Zhurnal Neorganicheskoi Khimii*, v. 2, no. 7, July 1957, p. 1566-1580 + 2 plates.

A radiographic and chemical study of compositions in the V-C system from V to VC obtained in the ranges 980-1270, 1300-1550, and 1720-2300 C.

18262* (Russian.) Application of Ultra-Sound to the Investigation of Steel Structure. **Primenenie ul'trazvuka dlia issledovaniia struktury stalei.** L. G. Merkulov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1386-1391.

Experimental investigations which show that ultra-sound can be successfully applied not only in metal defect detection but also in study of their structure; for instance: determination of hot annealed structure in steels, peening quality, grain size, and other properties. The method is based on measurement of the damping of ultrasonic waves in metals.

See also: **17476** (reaction of Zr with UO_2); **17552** (diffusion of Cu in PbS); **17553** (diffusion of Ni in PbS); **18098** (Mg-Si-Fe system); **18108** (effect of nitrogen on structure of gray iron); **18130** (twinning in steel); **18205** (microstructure of structural steels); **18426** (phase transition with multiple shocks); **18433** (stacking faults in crystals); **18464** (crystal growing methods).

METALS—POWDER

18263* Effect of Some Metal Additions on Molybdenum Disilicide. R. D. Grinthal. *Powder Metallurgy Bulletin*, v. 8, June 1957, p. 18-22.

Study of Cu, Cr, and Ti as binders.

18264 Reduction of Oxidized Nichrome V Powders and Sintering of Nichrome V Bodies. Paul Sikora and Philip Clarkin. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4032, Sept. 1957, 18 p. (TL570 Un3t)

Methods of obtaining essentially oxide-free powders were evaluated by O analyses, tensile tests, and microstructures of specimens made from reduced powders. The three techniques that effectively lowered the H content of as-received powders at 1800 to 2150 F in a H atmosphere were tumbling the powder in a rotary furnace, heating with NaH and C.

See also: **18119** (sintering atmospheres); **18140** (properties of sintered magnets); **18231** (TiB_2-CbB_2 system).

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

18265 Nondestructive Inspection of PWR Reference Fuel-Element Closures. D. E. Stutz, J. H. Cahn, K. D. Cooley, and S. A. Wenk. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-966, Dec. 1954, 33 p. (UF767 U3b Contin.)

Sensitivity of commercial tests to flaws at a welded interface.

18266 New Methods of Quality Control With Special Reference to Their Automation. II. Techniques of Electronic Micrometry. F. Förster, F. Valet, and A. Moser. *Henry Brutcher Translation No.* 3957, 17 p. (From *Technische Mitteilungen*, v. 50, no. 4, 1957, p. 174-181.) Henry Brutcher, Altadena, Calif.

New electronic micrometers. Details on multiple measurement instruments with television display. Application of micro-measurements to the recording of the macro and microform of part to be tested. Automation of measurement and control processes involving photo contacts. Method for automatic statistical quality control.

18267 Methods of Ultrasonic Testing of Welds. S. T. Nazarov and Iu. P. Panov. *Henry Brutcher Translation No.* 3958, 9 p. (From *Zavodskaia Laboratoriia,* v. 23, no. 3, 1957, p. 305-308.) Henry Brutcher, Altadena, Calif.

18268 Measurement of Size of Internal Flaws in Metal by an Ultrasonic Technique. F. I. Ivanov and M. A. Akulin. *Henry Brutcher Translation No.* 3968, 5 p. (From *Zavodskaia Laboratoriia,* v. 23, no. 3, 1957, p. 309-311.) Henry Brutcher, Altadena, Calif.

18269* (German.) Non-Destructive Testing of Castings by Ultrasonic Waves. **Zerstörungsfreie Prüfung von Gussstücken durch Ultraschall.** Günter Bierwirth. *Giesserei,* v. 44, Aug. 15, 1957, p. 477-485.

Necessity of a non-destructive test of the quality of castings. Physical fundamentals of the test. Measurements on single and two-phase brass and on cast-iron brake drums.

18270* (Russian.) Ultrasonic Detection of Defects in Cast Iron. **Ul'trazvukovaia Defektoskopiia chuguna.** N. V. Khimchenko. *Liteinoe Proizvodstvo,* 1957, no. 8, Aug., p. 15-18.

The effect of the shape and size of graphite particles on the ultrasonic diffusion in cast iron can be related to the size of the graphite grains.

18271 Nondestructive Testing of Reactor Fuel Elements. W. J. McGonnagle. *Nuclear Science and Engineering,* v. 2, Sept. 1957, p. 602-616.

Helium leak test; penetrant inspection; thermal test; radiography; acoustic methods; electrical resistance; eddy currents.

18272 (German.) The Endurance Strength of Crankshafts and Its Assessment by Acceptance Tests. **Die Dauerhaltbarkeit von Kurbelwellen und ihre Beurteilung in Ablieferungsprüfungen.** A. Theodor Wuppermann. *Stahl und Eisen,* v. 77, Aug. 22, 1957, p. 1117-1122.

Segregations in the ingot closed by forging show up after finishing as longitudinal surface defects. Even the smallest defects can be detected with present highly developed nondestructive tests.

18273 Automatic Gages and Machine Control. Arthur H. Wolfson. *Steel Processing and Conversion,* v. 43, Sept. 1957, p. 506-509.

18274* (Russian.) Ultrasonic Examination of Electro-Slag Welded Joints. **Ul'trazvukovaia defektoskopiia shvov vypolnennykh elektroshlakovoi svarkoi.** M. R. Gubanova. *Svarochnoe Proizvodstvo,* 1957, no. 8, Aug., p. 22-25.

Development of apparatus and method for ultrasonic control of heavy-section joints.

18275* (Russian.) Experiment in Ultrasonic Control of Electro-Slag Welded Joints. **Opyt ul'trazvukovogo kontrolia svarnykh shvov, vypolnennykh elektroshlakovoi svarkoi.** F. I. Ivanov and M. A. Akulinin. *Svarochnoe Proizvodstvo,* 1957, no. 8, Aug., p. 25-27.

Method for ultrasonic inspection on very heavy sections (up to 500 mm.) permitting dependable and precise detection of weld defects. Classification of defects according to indications of ultrasonic tests.

See also: **18103** (casting surface roughness measurement); **18153** (sonic examination of metals); **18262** (ultrasonic examination of steel); **18525** (radiation thickness gage).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

18276* (German.) Effect of Pressure on the Distribution of Orbital Angular Momentum of Electrons in the Atom. **Über die Druckabhängigkeit der Bahndrehimpulsverteilung der Elektronen im Atom.** P. Gombás. *Acta Physica Academiae Scientiarum Hungaricae,* v. 7, no. 3, 1957, p. 365-371.

The statistical Thomas-Fermi Model reveals that with high pressures ($P > 10^{14}$ dynes/sq. cm.), the states with small secondary quantum numbers are less filled than in the case of the face atom. States with large secondary quantum numbers are filled that otherwise stay unoccupied in free atoms and at lower temperatures.

18277 Antinucleons. E. Segrè. *American Journal of Physics,* v. 25, Sept. 1957, p. 363-369.

Historical background on antiparticles and the experimental work that led to the discovery of antinucleons. The latest experiments on cross-section measurements and modes of annihilation.

18278* Control of Nuclear Reactor Rods With an Integral Hydraulic Servo. A. Richter. *Applied Hydraulics,* v. 10, Sept. 1957, p. 91-93.

18279 Preliminary Design Requirements for Argonne Boiling Reactor (Arbor) Facility. L. W. Fromm, S. A. Bernsen, C. F. Bullinger, and J. F. Matousek. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5761, Rev., July 1957, 159 p. (UF767 Un3.1an Contin.)

18280 Equipment for Corrosion and Heat-Treatment Studies of Radioactive Materials. G. D. Calkins, J. E. Whitney, and E. C. Lusk. *ASTM Bulletin,* 1957, no. 224, Sept., p. TP145-TP147.

An apparatus for conducting postirradiation heat treatments outside of the hot cells was constructed and tested. A postirradiation corrosion experiment is described, also a typical heat-treatment experiment, including measurement of fission gas evolved during treatment. A procedure for testing several specimens simultaneously in the autoclave is included.

18281* Fuel Element Reprocessing. L. Koren Lund. *Atomics & Nuclear Energy,* v. 8, Sept. 1957, p. 333-335.

Details of a Norwegian pilot-plant.

18282* (Russian.) The Intensity Determination of Very Short Impulses of Fast Neutrons. **Opredelenie intensivnosti kratkovremennykh impul'sov bystrykh neitronov.** V. M. Gorbachev and Iu. S. Zamiatnin. *Atomnaia Energiia,* v. 3, no. 8, Aug. 1957, p. 101-105.

Use of a new method for quantitative determination of the yield of neutron pulses. Method is based on γ-rays originated at the moment of neutron capture after being slowed down in paraffin.

18283* (Russian.) Determination of the Naturally Radioactive Elements Using a Laboratory Radiometer. **Razdel'noe opredelenie estestvennykh radioaktivnykh elementov s pomoshch'iu laboratornykh radiometricheskikh metodov.** I. M. Nazarov. *Atomnaia Energiia,* v. 3, no. 8, Aug. 1957, p. 121-129.

Description of several methods used in determining natural radioactive elements in ores, minerals, and racks. General equations for determining the radioactive elements are given and their particular application in the case of Ra, U, Th, and K.

18284 Yields in U^{233} Thermal Neutron Fission. A. P. Baerg and Rosalie M. Bartholomew. *Canadian Journal of Chemistry,* v. 35, Sept. 1957, p. 980-985.

Quantitative ion exchange and 4π counting techniques were used to measure the yields of four nuclides not previously determined by mass spectrometric analysis. Values of 6.57, 6.30, 4.74, and 5.71% were obtained respectively for Ba^{139}, La^{143}, Sr^{89}, and Sr^{91} relative to a value of 6.32% for the yield of Ba^{140}. A precision better than 1.3% was achieved in the measurements.

18285 A Revised Semiempirical Atomic Mass Formula. A. G. W. Cameron. *Canadian Journal of Physics,* v. 35, Sept. 1957, p. 1021-1032.

A new formula which contains volume and surface energies, each with a symmetry energy contribution, Coulomb and Coulomb exchange energies, and shell correction and pairing energies.

18286 Packaged Power. *CEC Recordings,* v. 11, Sept.-Oct. 1957, p. 3-5.

Some facts on the Army Package Power Reactor.

18287* Some Engineering Problems in Connection With the Industrial Application of Nuclear Energy. Claude D. Gibb. *Chartered Mechanical Engineer,* v. 4, Sept. 1957, p. 353-367.

General review of factors in design, construction, and maintenance of power reactors.

18288* (French.) Polarization of the Electrons Emitted by S^{35}. **Polarisation des électrons émis par ^{35}S.** Hélène Langevin-Joliot and Nadine Marty. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 670-672.

The polarization of the β rays of the 128 k.e.v. (v/c=0.6) energy emitted by a source of S^{35} was equal to -0.38 ± 0.1. The thickness of the source, among other factors can reduce the polarization of the beam.

18289* (French.) The Alpha Spectrum of Bismuth-212 (ThC). **Spectre α du bismuth 212(ThC).** Robert J. Walen and Genevieve Bastin-Scoffier. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 676-677.

A new α_0 line with an intensity of 10^{-5} of the total intensity was revealed. A regularity of energy differences might be due to a family of vibration levels.

18290* (French.) Study of the Light Emitted in the Moderator of a Heavy Water Atomic Pile. **Étude de la lumière émise dans le modérateur d'une pile atomique à eau lourde.** Denis Breton and Jean-Loup Delcroix. *Comptes Rendus*, v. 245, Aug. 19, 1957, p. 842-845.

Spectral study of the bluish light appearing in the heavy water. Variation of the light intensity as a function of the power of the pile.

18291 Xenon Tables. Hugh K. Clark and Julius C. English. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-200, May 1957, 134 p. (UF767 Un3.1dp Contin.)

Tables for use in estimating the reactivity transients resulting from Xe poisoning in any thermal reactor that employs U-235 as the principal fissionable material.

18292 Radiation Hazard Control in a Power Reactor Installation. R. M. Taylor. *Electrical Engineering*, v. 76, Oct. 1957, p. 880-883.

18293* (French.) General Data on the Designing of Reactors, Taken From a Few Practical Instances. **Données générales sur les calculs des réacteurs, tirées de quelques exemples pratiques.** J. Gignier. *Génie Chimique (Supplement to Chimie & Industrie)*, v. 78, Aug. 1957, p. 33-45.

Examples requiring only conventional calculation may sometimes be simplified by the use of graphical methods.

18294 The Plutonium Recycle Program—A Resumé of the Concept, Program, and Facilities. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-50700, June 1957, 50 p. (UF767 Un3.1hw Contin.)

18295* (English.) **Slowing Down Age of Neutrons From a Ra-α-Be Source to Indium Resonance in Aluminium Light Water Mixtures.** V. P. Duggal and S. M. Puri. *Indian Academy of Sciences, Proceedings*, v. 46, no. 1, sec. A, July 1957, p. 72-79.

Determination of the value of Fermi age to indium resonance for pure water and Al-water mixtures.

18296* An Ion Blower for the Elimination of Static Electricity. Knut Ljunggren. *International Journal of Applied Radiation and Isotopes*, v. 2, no. 2, 1957, p. 105-109.

An ion blower with a shielded radioactive source can be efficiently used for supplying elimination currents up to 0.1μ A from β-emitting sources with no radiation hazards.

18297* A Graphical Absolute Method for Range Determination of β-Particles. F. Barreira and M. Laranjeira. *International Journal of Applied Radiation and Isotopes*, v. 2, no. 2, 1957, p. 145-148.

18298* Production of Carrier-Free Aluminum-26 and Sodium-22. Robert A. Rightmier, Truman P. Kohman, and Alexander J. Allen. *International Journal of Applied Radiation and Isotopes*, v. 2, nos. 3-4, 1957, p. 274-279.

Above are produced simultaneously by deuteron bombardment of water-cooled high-purity magnesium targets. A chemical procedure for isolation is outlined.

18299 The Mass-Yield Curve for Fission of Natural Uranium by 14-MeV Neutrons. J. G. Cuninghame. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 1-5.

18300 Half-Life of ^{238}Pu. Darleane C. Hoffman, George P. Ford, and Francine O. Lawrence. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 6-11.

The weighted average of two determinations is 86.41 years, with an estimated error of 0.3 year.

18301 The Occurrence of the Short-Lived Iodine Isotopes in Natural and in Depleted Uranium Salts. F. T. Ashizawa and P. K. Kuroda. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 12-22.

18302 Neutron Irradiation of Some Crystalline Salts of Phosphoric, Phosphorous, and Hypophosphorus Acids in Vacuum. Philip A. Sellers, Takuya R. Sato, and Harold H. Strain. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 31-47.

18303 Resonance Escape Probability in Thermal Reactors. J. B. Sampson and J. Chernick. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1754, Aug. 1957, 68 p. (UF767 Un3.1ka Contin.)

Review of current theorelectrical studies.

18304 Reactor Design and Evaluation Progress Report, May, 1954-December, 1956. R. J. Beeley. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1873, June 1957, 99 p. (UF767 Un3.1na Contin.)

Analytical studies of organic moderated reactors. Capsule corrosion tests in hydrocarbons. Reactor calculation procedures.

18305 Construction and Operation of the AE-6 Water Boiler Reactor. V. A. Swanson, et al. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1920, Aug. 1957, 56 p. (UF767 Un3.1na Contin.)

18306 Reactor Evaluation Quarterly Progress Report, Jan.-Mar. 1957. R. J. Beeley. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1938, June 1957, 29 p. (UF767 Un3.1na Contin.)

Plutonium feedback; potential use of reactors in the sugar, pulp, and paper industries; high-activity fission product waste disposal.

18307* Some Features of Regenerative Deflection and Their Application to the Harvard Synchrocyclotron. G. Calame, et al. *Nuclear Instruments*, v. 1, July 1957, p. 169-182.

Design considerations of the regenerator system; magnetic field measurements and calculations; regenerator performance and beam extraction.

18308* The Time-of-Flight Technique Applied to Fast Neutrons. K. G. Malmfors, J. Kjellman, and A. Nilsson. *Nuclear Instruments*, v. 1, July 1957, p. 186-196.

The time-of-flight principle; bunching mechanism in the cyclotron; system used at the Nobel Institute; resolution; determination of the mean proton energy.

18309* On Diffusion Cloud Chambers. Hilding Slätis. *Nuclear Instruments*, v. 1, July 1957, p. 213-226 + 2 plates.

Several chambers are described and photographs of tracks demonstrate the use of these chambers.

18310* Coulomb Corrections in Allowed Beta Transitions. J. D. Jackson, S. B. Treiman, and H. W. Wyld, Jr. *Nuclear Physics*, v. 4, Aug. 1957, p. 206-212.

Complete expressions, with all Coulomb effects taken into account, are given for the distribution functions for allowed β decay, including recoil, nuclear orientation, and electron polarization effects.

18311* The Isomerism of Elementary Particles. Hiroomi Umezawa and Antoine Visconti. *Nuclear Physics*, v. 4, Aug. 1957, p. 224-233.

Weak interactions are discussed from the point of view of the isomerism of elementary particles. A generalized gage transformation is introduced to discuss the isomerism of the neutrino. A possible formulation for the isomerism of particles with finite masses is also pointed out.

18312* An Alpha-Particle Model for the Nuclear Photodisintegration of O^{16}. Hans Wilhelmsson and Margita Nilsson. *Nuclear Physics*, v. 4, Aug. 1957, p. 234-239.

18313* On the Interaction Between μ-Mesons and Nucleons. I. S. Shapiro, E. I. Dolinsky, and L. D. Blokhintsev. *Nuclear Physics*, v. 4, Aug. 1957, p. 273-276.

The angular distribution and longitudinal polarization of neutrons produced in the capture of μ-mesons by μ-mesohydrogen are computed.

18314 Monte Carlo Calculation of the Slowing-Down Time Distribution for Neutrons in Hydrogen. George E. Haynam and Marshall F. Crouch. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 626-630.

18315 An Experimental Study of Transient Boiling. M. W. Rosenthal. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 640-656.

Heat was generated electrically in Pt and Al ribbons in such a manner as to produce exponentially increasing heat generation rates which simulated reactor excursions. Effects of water temperature, exponential period, and gas concentration were studied.

18316 The Chemical Processing of Two-Region Aqueous Homogeneous Reactors. D. E. Ferguson. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 664-675.

Discusses the problems anticipated in removing insoluble fission and corrosion products from the reactor fuel system with hydroclones, an alternate scheme to solvent extraction for processing the hydroclone underflow, and recent results of iodine chemistry studies under simulated reactor conditions.

18317 Transient Pressures in Nuclear Reactors. J. A. Fleck, Jr. *Nuclear Science and Engineering*, v. 2, Sept. 1957, p. 694-708.

18318 Power Reactors. *Nucleonics*, v. 15, Sept. 1957, p. 90-110.

Predictions of problems and trends of the next decade. Covers the government view, economic trends, technical problems, outlook for utilities, and the equipment market.

18319 Calculating Spatial Distribution of Reactivity Coefficients. Henry E. Stone. *Nucleonics*, v. 15, Sept. 1957, p. 185-188.

Methods for calculating variation of reactivity with time caused by transient temperature variations in the core of the reactor.

18320 "Metallo-Organic" Polymers—Possible Fuel Materials. A. J. Restaino. *Nucleonics*, v. 15, Sept. 1957, p. 189-191.

Polymers of mono- and dicarboxylic acids with U chemically bound in may prove suitable as nuclear-reactor moderator-fuel materials. Promising properties are high values of N_H (number of H atoms per cc.), excellent heat and radiation stability and complete homogeneity even at maximum metal content.

18321* (English.) **Linear Theory of Synchrotron Oscillations. II. Particle Losses During Acceleration and Tolerance Theory.** L. L. Goldin and D. G. Koškarev. *Nuovo Cimento*, v. 6, ser. 10, Aug. 1957, p. 286-298.

Various types of synchrotron oscillation perturbations of accelerated particles are examined from the standpoint of the particle losses they produce. A system of tolerances for a prescribed particle loss is set up.

18322* (English.) **The Orbital Electron Capture Decay of ^{185}Os.** A. Bisi, E. Germagnoli, and L. Zappa. *Nuovo Cimento*, v. 6, ser. 10, Aug. 1957, p. 299-303.

The total decay energy was found to be 984 k.e.v.

18323* (English.) **Operating Characteristics of a Gas-Liquid Bubble Chamber.** F. W. Bullock, C. Dodd, C. Henderson, and G. Kalmus. *Nuovo Cimento*, v. 6, ser. 10, Aug. 1957, p. 334-339.

Experiments were performed to determine the effect of temperature on the sensitivity of a bubble chamber filled with various concentrations of methane gas in liquid propane. As the concentration of methane is increased, the operating pressure for any given degree of sensitivity increases by about 0.3 atm. for every degree C decrease in temperature.

18324* (English.) **The High Energy Limit of the Potential Scattering. I. Non Relativistic Kinematics.** M. Verde. *Nuovo Cimento*, v. 6, ser. 10, Aug. 1957, p. 340-354.

Some asymptotic expansions of the phase shifts are derived, corresponding to high energies and a non-relativistic potential scattering. An approximation of the total scattering amplitude is also presented; its validity extends to all angles of scattering with the exception of the vicinity of 180°.

18325* On the Measurement of Velocity of Relativistic Particles. Y. Aharonov and D. Bohm. *Nuovo Cimento (Supplemento)*, v. 5, ser. 10, no. 3, 1957, p. 429-439.

Considers particles satisfying and not satisfying Dirac's equation.

18326 Thorium Rod Blanket Study for Thermal Breeder Reactor. H. C. McCurdy, et al. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-55-8-194 (Del.), Aug. 1955, 189 p. (UF767 Un3.1cf Contin.)

A two-region thermal breeder consisting of a homogeneous core of $U^{233}O_2SO_4$ in D_2O and a blanket of Th metal rods suspended in D_2O is investigated from the standpoint of the economics of such a reactor as a central station power producer.

18327 A Conceptual Design of a Pressurized-Water Package Power Reactor. A. L. Boch, W. R. Gall, G. F. Leichsenring, and R. S. Livingston. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1613(Rev.)(Del.), June 1955, 370 p. (UF767 U3o Contin.)

18328 Army Package Power Reactor Critical Experiment. D. V. P. Williams, et al. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2128, Aug. 1956, 76 p. (UF767 U3o Contin.)

Results of experiments, including measurements of critical mass, flux, and power distributions, and an evaluation of design control rods.

18329 Energy and Angular Distribution of Gamma Radiation From a Co^{60} Source After Diffusion Through Many Mean Free Paths of Water. R. W. Peelle, F. C. Maienschein, and T. A. Love. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2196, Sept. 1957, 26 p. (UF767 U3o Contin.)

18330 Homogeneous Reactor Project Quarterly Progress Report for Period Ending April 30, 1957. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2331, Sept. 1957, 176 p. (UF767 U3o Contin.)

18331 MTR Technical Branch Quarterly Report, First Quarter—1957. W. B. Lewis. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16373, July 1957, 53 p. (UF767 Un3.1id Contin.)

Progress report covering plant, MTR-ETR development, reactor physics and engineering, and nuclear physics.

18332 Stability Tests With the SPERT-I Reactor. F. Schroeder. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16383, July 1957, 13 p. (UF767 Un3.1id Contin.)

Tests were conducted with the initial bulk water temperature at 20 and 97 C (boiling), and with the initial height of the water head over the core at 2-ft. and 9-ft.

18333 A Neutron Absorption Alignment Chart. Robert G. Nisle. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16389, July 1957, 5 p. (UF767 Un3.1id Contin.)

Nomogram relates flux depression to thickness of interposed foil or wire.

18334 Proportional Counter Measurements of π-Mesonic X-Rays. D. West and E. F. Bradley. *Philosophical Magazine*, v. 2, ser. 8, Aug. 1957, p. 957-976.

A xenon filled proportional counter has proved to be a very useful instrument for the study of π-mesonic X-rays from light elements. Measurements of the $K\alpha$ energies from ^{6}Li, ^{7}Li, ^{9}Be, ^{10}B, and ^{11}B are described. Energy shifts due to the short range pion-nucleon forces are observed, confirming the scintillation counter measurements.

18335 Nuclear Alignment of Ytterbium 175. M. A. Grace, C. E. Johnson, R. G. Scurlock, and R. T. Taylor. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1079-1084.

Data was obtained by cooling a single crystal of ytterbium ethyl sulfate to about 0.014 K, and observing the anisotropic angular distributions of the two most energetic γ-rays.

18336 K-Capture in Carbon 11. J. Scobie and G. M. Lewis. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1089-1099.

18337 On the Longitudinal Polarization of β-Particles. P. E. Cavanagh, J. F. Turner, C. F. Coleman, G. A. Gard, and B. W. Ridley. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1105-1112.

18338 Excited States in Co^{59} and Fe^{56}. M. Mazari, A. Sperduto, and W. W. Buechner. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 365-367.

Energy-level scheme of Co^{59} was investigated through studies of inelastic proton scattering. An electrostatic accelerator and a high-resolution magnetic spectrograph were used. Region of excitation ranged from ground state to 3.6 m.e.v. and 40 excited states were found.

18339 Characteristic Energy Loss of Electrons Passing Through Metal Foils. II. Dispersion Relation and Short Wavelength Cutoff for Plasma Oscillations. Richard A. Ferrell. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 450-462.

Hartree self-consistent field method is used to provide a direct quantum-mechanical analog to the Bohm-Gross derivation of the dispersion relation. The effect of electron exchange decreases the dependence of the plasma frequency on wave number.

18340 Measurements of Large-Angle Single Collisions Between Helium, Neon, and Argon Atoms at Energies to 100 kev. E. N. Fuls, P. R. Jones, F. P. Ziemba, and E. Everhart. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 704-710.

Single collisions between ions and atoms were studied at 25, 50, and 100 k.e.v. energies for the cases He^+ on He, He^+ on Ne, He^+ on A, Ne^+ on Ne, Ne^+ on A, and A^+ on A.

18341 Excitation of Characteristic *K* X-Rays From Elements by Protons, Deuterons, and Alpha Particles. B. Singh. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 711-715.

18342 Probabilities of Symmetric and Asymmetric Fission in the Proton Bombardment of Th^{232}. B. J. Bowles, F. Brown, and J. P. Butler. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 751-756.

The ratio of symmetric to asymmetric fission in the proton bombardment of Th^{232} does not rise steadily with increasing proton energy; a periodic decrease is superposed upon the overall increase. This is attributed to the changing pattern of various fission reactions, (p,f), (p,nf), etc.

18343 Beta Decay of C^{14} and Nuclear Forces. William M. Visscher and Richard A. Ferrell. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 781-796.

The anomalously long lifetime of C^{14} is interpreted as being due to an accidental cancellation in the β-decay matrix element which is complete to about one part in 160. In the shell model with oscillator wave functions, general two-nucleon interactions are introduced which are linear in the velocities and which satisfy various invariance requirements. As many of the force parameters are determined from low-energy experimental nuclear data as possible.

18344 Transition Amplitudes for Photoproduction of Mesons From Nucleons and Photodisintegration of the Deuteron. L. Donald Pearlstein and Abraham Klein. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 836-842.

18345 Angular Distribution of Fragments From the Fission of Bismuth by 450-Mev Protons. Robert L. Wolke and Joel R. Gutmann. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 850-855.

18346 Mu Decay With Nonconservation of Parity. Siguard Larsen, Elihu Lubkin, and Menasha Tausner. *Physical Review*, v. 107, ser. 2, Aug. 1, 1957, p. 856-858.

The distribution of the decay electrons from polarized μ mesons is calculated, without presumption of parity conservation, time-reversal invariance, or charge-conjugation invariance. The four-component neutrino theory is used.

18347 Polarization and Exchange Effects in the Scattering of Electrons From Atoms With Application to Oxygen. Aaron Temkin. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1004-1012.

18348 Relation of the Deuteron Photodisintegration Cross Section to the Neutron-Proton Force. Roger G. Newton. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1025-1027.

For a very general class of neutron-proton triplet S-phase shifts, given as functions of the energy, the experimental deuteron photodisintegration cross section singles out the neutron-proton central triplet potential with the shortest exponential tail. It is therefore powerful evidence for a short decay length of this potential.

18349 Interaction of a Nucleon With the Nucleus. Erich Vogt and Jean Lascoux. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1028-1040.

The importance of nucleon-nucleon correlations and the Pauli principle in the excited states of nuclei is studied.

18350 Decay of Molybdenum-91. J. D. Prentice and K. G. McNeill. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1041-1043.

18351 Delayed Neutrons From Fissionable Isotopes of Uranium, Plutonium, and Thorium. G. R. Keepin, T. F. Wimett, and R. K. Zeigler. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1044-1049.

18352 Ratio of *L*/*K* X-Ray Intensities in Thallium-204 Decay. Henry Schmied and Richard W. Fink. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1062-1064.

18353 Beta Decay and the Conservation of Parity. L. C. Biedenharn and H. E. Rorschach. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1075-1076.

An interpretation of recent experiments on the conservation of parity is proposed, which, utilizing a zero-rest-mass neutrino and Yukawa's model for the β decay, conserves C and P separately for the nucleons as well as conserving CP for the over-all β interaction.

18354 Angular Distributions of Scattered Neutrons. A. Langsdorf, Jr., R. O. Lane, and J. E. Monahan. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1077-1087.

Values from 36 elements and one compound were measured over the energy interval of 60 to 1800 kev.

18355 Calculations of the Energy Levels in Deformed Nuclei. Kailash Kumar and M. A. Preston. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1099-1103.

18356 Generalized Effective Range Theory for Nucleon-Nucleon Scattering. Robert B. Raphael. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1135-1144.

A method is proposed for obtaining limitations on the shape and possible energy dependence of the force in a given scattering state of the two-nucleon system, from a knowledge of the phase shift in that state over the nonrelativistic domain, and is illustrated for S waves.

18357* (English.) **Cosmic Ray Nuclear Interactions in Nitrogen Gas.** Saburo Miyake, Kensaku Hinotani, Itsuo Katsumata, and Tatsunosuke Kaneko. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 845-854.

Studies were made in a N-filled high-pressure cloud chamber at Mt. Norikura (2840 m. above sea level and 25° N geomagnetic latitude).

18358 The Measurement of Fast Neutron Flux Over the Neutron Energy Range 0·03 MeV to 3·0 MeV. W. D. Allen and A. T. G. Ferguson. *Physical Society, Proceedings*, v. 70, no. 453A, Sept. 1957, p. 639-653.

Comparison of accuracy of a proton recoil counter and a Hansen-McKibben type long counter.

18359 Polarization Experiments in Proton-Proton Scattering. T. V. Kanellopoulos and G. E. Brown. *Physical Society, Proceedings*, v. 70, no. 453A, Sept. 1957, p. 690-702.

18360* (Polish.) Nuclear Power Station Prototypes. **Elektrownie jądrowe.** Władysław Ney. *Przeglad Techniczny*, v. 78, no. 14, July 1957, p. 550-556.

Structure, operation, and classification of nuclear reactors. The cooling problem. Description and plan of some stations.

18361* Calorimetric Determination of the Ratio of Energy Absorption to Ionization for 22-Mev X-Rays. L. D. Skarsgard, J. P. Bernier, D. V. Cormack, and H. E. Johns. *Radiation Research*, v. 7, Sept. 1957, p. 217-228.

18362 Measurement of Neutron Spectra by Use of Nuclear Emulsions Loaded With Li^6 Glass Specks. J. H. Roberts and F. E. Kinney. *Review of Scientific Instruments*, v. 28, Aug. 1957, p. 610-615.

Calibrations were made by exposure to monoergic neutrons at several energies and the method was tested by neutron spectra determined independently from fission and "long counter" data. The theory of the reduction of track data to neutron spectra is given. The results look promising for application to the measurement of neutron spectra in fast critical assemblies and for similar problems.

18363* Linear Electron Accelerators. Principles and Applications. Morris Ettenberg. *Sperry Engineering Review*, v. 10, July-Aug. 1957, p. 7-11.

The over-all behavior of a high-energy electron producing machine is described mathematically, and its uses in various fields outlined.

18364 (German.) Modern Particle Accelerators. **Moderne Kresbeschleuniger für Elektronen.** F. Timpl. *Technik*, v. 12, July 1957, p. 513-518.

Description and operation of the betatron double ray betatron, electron synchrotron, and microtron.

18365 4-Pi Gamma Ionization Chamber Decay Measurements of Fallout Samples From Operation Castle. W. H. Shipman and J. R. Lai. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-147, Jan. 1956, 16 p. (QC475 Un3.5r Contin.)

Characteristics of fallout from detonations at the Pacific Proving Grounds.

18366 Index to Information Available on the Crocker 60-Inch Cyclotron. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-1651 (3rd Rev.), July 1957, 13 p. (UF767 U3u Contin.)

A list of reports and engineering notes.

18367 High-Energy Particle Data. John H. Atkinson, Jr. and Beverly Hill Willis. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-2426 (Rev.), v. 2, June 1957, 92 p. (UF767 U3u Contin.)

Range-energy curves. Range-momentum curves. Miscellaneous supplemental data.

18368 Interactions of K^- Mesons in Hydrogen. Luis W. Alvarez, et al. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3775, July 1957, 19 p. (UF767 U3u Contin.)

Cross sections for K^- elastic scattering and $\Sigma^+ + \Sigma^-$ production in flight as a function of momentum.

18369 Neutrons From (a,n) Sources. Wilmot N. Hess. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3839, July 1957, 41 p. (UF767 U3u Contin.)

The neutron energy spectra and yields for several (a,n) neutron sources are calculated and compared with experimental values.

18370 The Scintillation Camera: A New Instrument for Mapping the Distribution of Radioactive Isotopes. Hal O. Anger. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3845, July 1957, 18 p. (UF767 U3u Contin.)

Device consists of a lead shield with a pinhole aperture, a scintillating crystal viewed by a bank of photomultiplier tubes, a signal matrix circuit, and an oscilloscope with a scope camera.

18371 Spin and Hyperfine Structure Measurements of Two Neutron-Deficient Gallium Isotopes. John L. Worcester. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3868, July 1957, 83 p. (UF767 U3u Contin.)

18372* (German.) The Structure of the Atomic Nucleus. **Der Aufbau des Atomkerns.** Gerd Burkhardt. *VDI Zeitschrift*, v. 99, Aug. 1957, p. 1175-1187.

Properties. Different sorts of radioactive radiations. Radiation energy. Disintegration. The nucleons. Energy surface. Mass defect. Binding energy and mass number. Models. Reactions.

18373* (German.) Accelerator for Experimental Nuclear Physics. **Beschleuniger für die experimentelle Kernphysik.** Christian Keck. *Wissenschaftliche Annalen*, v. 6, no. 8, Aug. 1957, p. 543-571.

Description and use of high-voltage linear and circular accelerators, including the microtron, betatron, cyclotron, synchrocyclotron, electron synchrotron, proton synchrotron, and the concentration-focusing synchrotron.

18374* (German.) Determining the Polarization of the β-Particles of $Sr^{90} + Y^{90}$. **Nachweis der Polarisation der β-Teilchen von $Sr^{90} + Y^{90}$.** Joachim Heintze. *Zeitschrift für Physik*, v. 148, no. 5, 1957, p. 560-563.

18375* (German.) Contribution to the Alpha Disintegration Theory (Especially of the Nucleus in the Neighborhood of Pb^{208}). **Zur Theorie des a-Zerfalls (insbesondere der Kerne in der Umgebung von Pb^{208}).** Hans Jörg Mang. *Zeitschrift für Physik*, v. 148, no. 5, 1957, p. 582-592.

Calculation of disintegration constants with shell structure model functions. Disintegrations $Po^{211} \rightarrow Pb^{207}$ and $Po^{212} \rightarrow Pb^{208}$.

18376* (German.) Stimulation of X-*K*-Radiations of Ni, Cu and Mo Through Po^{210} a-Particles. **Anregung der Röntgen-*K*-Strahlung von Ni, Cu und Mo durch Po^{210}-a-Teilchen.** Wolfgang Bühring and Otto Haxel. *Zeitschrift für Physik*, v. 148, no. 5, 1957, p. 653-661.

A proportional indicator tube was used. Variation of the *E*-energy of the a-particles by deceleration in N. The absolute values for 5.3 m.e.v. are respectively 18.7, 14.8, and 0.61 X 10^{-4} (± 15%) quanta per a-particle.

18377* (Russian.) Measurements With a Slowing-Down-Time Neutron Spectrometer Employing Lead. Excited Level of the He^4 Nucleus. **Izmereniia s neitronnym spektrometrom po vremeni zamedleniia v svintse. Vozbuzhdennyi uroven' iadra He^4.** A. A. Bergman, A. I. Isakov, Iu. P. Popov, and F. L. Shapiro. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 9-16.

Results of measurement of the energy dependence of the cross sections for the following reactions are presented: (n,γ) in Fe, Pb, and Cl; (n,p) in He^3, N^{14}, and Cl; (n,α) in Li^6 and B^{10}.

18378* (Russian.) Photodisintegration of Helium. **Fotorasshcheplenie geliia. I.** A. N. Gorbunov and V. M. Spiridonov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 21-32 + 2 plates.

Photodisintegration was studied in a cloud chamber located in a magnetic field and synchronized with a 170 MeV. bremsstrahlung beam. The yields of various photonuclear reactions on He, the energy dependence of the effective cross section of the He^4 (γ,p) H^3 reaction and the angular distributions of protons and tritons arising in this reaction were measured.

18379* (Russian.) Polarization in the $(p$-$p)$-Scattering at 635 MeV. **Poliarizatsiia v $(p$-$p)$-rasseianii pri 635 MeV.** M. G. Meshcheriakov, S. B. Nurushev, and G. D. Stoletov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 37-46.

18380* (Russian.) Elastic Collision Cross Section for Hydrogen Atoms. **Sechenie uprugogo stolkroveniia atomov vodoroda drug s drugom.** V. S. Kudriavtsev. *Zhurnal Eksperimental' noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 243-250.

A graph is given for the dependence of the cross sections on the energy of relative motion in the energy range from 0.05 ev. to 3 kev.

18381* (Russian.) On the Magnetic Field of a Betatron. **Zakonomernosti magnitnogo polia betatrona.** B. N. Rodimov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, June 1957, p. 1330-1336.

Derivation of an equation which describes all properties of the focusing magnetic field of a betatron and is applicable for calculation of a betatron field with specified properties.

18382* (Russian.) Resonance Perturbations of Synchrotron Oscillation in Charged Particle Accelerators. **Rezonansnye vozmusheheniia sinkhrotronnykh kolebanii v uskoriteliakh zariazhennykh chastits.** I. S. Danilkin and M. S. Rabinovich. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1558-1570.

Effect of resonance harmonic perturbations on the phase movement and on the intensity of accelerated particles. Comparison of theoretical and experimental data obtained in a proton synchrotron.

18383* (Russian.) Pulse Ionization Chamber as a Device for Simultaneous Investigation of Energetic and Angular Distributions of Charged Particles. **Impul'snaia ionizatsionnaia kamera kak pribor dlia odnovremennogo izucheniia energeticheskikh i uglovykh raspredelenii zariazhennykh chastits.** B. A. Bochagov, A. A. Vorobev, and A. P. Komar. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1575-1577.

Suggests a new method in which a simultaneous measurement of particle energy and the angle, under which it originates, could be made.

See also: **17228** (purification of nuclear fuels); **17256** (glass betatron toroids); **17296** (use of nuclear reactor in petroleum processing); **17476** (reaction of Zr with UO_2); **17513** (annealing of radiation damage in Co complexes); **17780** (atomic energy in industry); **17868** (cosmic ray air showers); **17899** (steam generators for nuclear power plants); **17931** (radiation gages); **18004** (applications of Cb); **18006** (reactor metallurgy); **18013** (high boron steels for nuclear reactors); **18027** (uranium alloy data); **18238** (effects of radiation on metals); **18265** (nondestructive inspection of fuel elements); **18271** (testing of fuel elements); **18386** (design of nuclear instruments); **18456** (radiation effects); **18463** (plasmas for thermonuclear power); **18570** (nuclear power prospects for pulp and paper industry); **18623** (welding of nuclear reactor pressure vessels).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

18384 What Makes Executives Run? Arch Patton. *Dun's Review and Modern Industry*, v. 70, Sept. 1957, p. 36 + 7 pages.

Describes how a company can provide the maximum incentive for its management team.

18385 Data on Human Performance for Engineering Designers. K. F. H. Murrell. *Engineering*, v. 184, Sept. 13, 1957, p. 344-347.

Industrial heat and noise are considered with reference to methods of measurement, harmful effects, methods of personal protection, and effect on efficiency. (To be continued.)

18386 Man-Instrument Relationships in the Design of Nuclear Instrumentation. G. L. Coe and F. W. Trabold. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, June 1957, p. 74-78. (TK1 In6.6i Contin.)

Human engineering principles. Pychometric testing. As an example, a design program for a portable survey meter is discussed.

18387* The Development of Organizations in a Laboratory. Harold Guetzkow and Anne E. Bowes. *Management Science*, v. 3, July 1957, p. 380-402.

Concludes that the extension of face-to-face group methodology to the study of organizations and laboratories is feasible.

18388* Networks of Waiting Lines. James R. Jackson. *Operations Research Society of America, Journal*, v. 5, Aug. 1957, p. 518-521.

Analysis of scheduling varying flows through complex networks. A typical, practical example is mathematically treated.

18389* A Model for Optimum Control of Stochastic Sampled-Data Systems. Albert B. Bishop. *Operations Research Society of America, Journal*, v. 5, Aug. 1957, p. 546-550.

The principal development concerns a simple proportional control system with fixed proportionality constant.

18390* Measurement and Control in the Human Operator. W. K. Taylor. *Society of Instrument Technology, Transactions*, v. 9, Sept. 1957, p. 104-111.

An attempt to formulate a theory that will enable predictions to be made about the functional properties of the movement-control networks of the nervous system.

18391* The Human Operator as a Single Channel Information System. R. Davis. *Quarterly Journal of Experimental Psychology*, v. 9, Aug. 1957, p. 119-129.

Attempts to reconcile data with the known facts about the peripheral and central components of reaction time. The possibility that delays are the result of occupation of the channel for a central time plus a central refractory time is suggested.

18392 (German.) Organization of Supply of Materials and Production as a Means for Planning and Management. **Stoffwirtschaft und Arbeitsvorbereitung als Mittel der Planung und Lenkung.** Werner Schütte, Ulrich Sabass, Hans-Heinrich von Lintig, and Anton Schütz. *Stahl und Eisen*, v. 77, Aug. 22, 1957, p. 1146-1160.

Production control records. Cost accounting procedures.

See also: **17619** (integrated data processing systems); **18067** (chill casting of steel).

ORE AND MATERIALS BENEFICIATION

18393 Solvent Extraction Equilibria for Rare Earth Nitrate-Tributyl Phosphate Systems. Lester L. Knapp, Morton Smutz, and F. H. Spedding. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-766, Aug. 1956, 39 p. (UF767 Un3.1is Contin.)

18394 Beneficiation of Low Grade Saskatchewan Uranium Ores. IV. L. W. Crawford, Brad Gunn, S. D. Cavers, and A. B. Van Cleave. *Canadian Journal of Chemical Engineering*, v. 35, Oct. 1957, p. 99-104.

Most successful beneficiation was attained using sodium hexametaphosphate conditioner, sodium myristate collector, and oleic acid frother.

18395 Dry Magnetic Concentration. P. E. Cavanagh and E. W. Williams. *Canadian Mining and Metallurgical Bulletin*, v. 50, Sept. 1957, p. 558-564; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 60, 1957, p. 326-332.

Equipment and pilot plant results for dry magnetic grinding and concentration of iron ore.

18396* (German.) Frequency Research Applied to the Dressing Control of Pit Coal. **Wäscheüberwachung in der Steinkohlenaufbereitung mit Hilfe der Grosszahlforschung.** Oskar Sommer. *Glückauf*, v. 93, Aug. 31, 1957, p. 1085-1094.

Statistical methods for controlling coal properties. Use of punched cards.

18397* (Russian.) Certain Characteristics of Flotation of Ferrous Metal Ores. **Nekotorye osobennosti flotatsii rud chernykh metallov.** Z. S. Bogdanova. *Gornyĭ Zhurnal*, 1957, no. 8, Aug., p. 3-9.

Flotation of ferrous metal ores depends on density and temperature of the pulp, aeration in the flotation machine, rotation speed of the impeller, fineness of the ore, and selection of collectors.

18398* (Russian.) Concentration of Potassium Ores by Flotation Method. **Flotatsionnoe obogashchenie kaliinykh rud.** A. A. Zhelnin. *Gornyĭ Zhurnal*, 1957, no. 8, Aug., p. 9-11.

Search for more effective and inexpensive flotation agents. Technical expediency of flotation method is confirmed by result of laboratory investigations.

18399 Application to the Packed Column to the Redox Process. E. R. Irish. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-29967 A, Mar. 1957, 21 p. (UF767 Un3.1hw Contin.)

Performance characteristics determined for packed solvent extraction columns during development work on Pu and U separation and decontamination from fission products contained in irradiated U fuel elements.

18400 Performance of a Plutonium Reflux Solvent Extraction System. B. F. Judson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49441 A, Mar. 1957, 13 p. (UF767 Un3.1hw Contin.)

18401 Application of the Pulse Column to the Purex Process. R. G. Geier. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49542 A, Apr. 1957, 33 p. (UF767 Un3.1hw Contin.)

General aspects, including the effects of factors influencing performance, of pulsed solvent extraction columns for purifying U and Pu. Includes improvements in column internals resulting from development studies directed toward extending the range of column operability by increasing amplitude-frequency limitations and/or reversing the choice of continuous phase.

18402 Removal of Fission Products From Feeds. M. K. Harmon. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49544 A, Apr. 1957, 24 p. (UF767 Un3.1hw Contin.)

An auxiliary pre-treatment step in the preparation of a feed solution for solvent extraction separation processes can be used for removing most of the three most troublesome fission products Ru, Zr, and Nb.

18403* Determination of Froth-Flotation-Washability Data. C. C. Dell. *Institute of Fuel, Journal*, v. 30, Sept. 1957, p. 523-526.

"Release analysis" is applied to coal for obtaining froth-flotation-washability data. It consists of splitting up the flotation froth into several fractions which are refloated two or three times in order to improve the sharpness of separation between them.

18404 Something New in Sintering. Harold E. Rowen, Patrick V. Gallagher, and Thomas E. Ban. *Iron and Steel Engineer*, v. 34, Aug. 1957, p. 133-144.

Developments in sintering processes, equipment design, and capacity.

18405 The Reduction of Plutonium by Tetravalent Uranium. Jan Rydberg. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 1, 1957, p. 79-86.

Some experiments to establish the possibilities of using U(IV) as a reducing agent for Pu, particularly in liquid-liquid extractions and in the presence of HNO_3.

18406 Continuous Countercurrent Ion Exchange in Hydrometallurgical Separators. Clement K. Chase. *Mining Engineering*, v. 9, Sept. 1957, p. 1001-1003.

18407* (Polish.) The Treatment of Glance Metal to Produce Feed Materials. **Przerób metalu błyszczqcego na materiały wsadowe.** Stanisław Wołoszyn. *Rudy i Metale Niezelazne*, v. 2, no. 2, June 1957, p. 61-64.

Formation of glance metal. Chemical composition and structure. Transformation possibilities on laboratory scale and choice of the oxidation method. Grinding. Lixiviation.

18408* Determination of the Viscosity of Unstable Industrial Suspensions With the Aid of a Stormer Viscosimeter. P. J. Van der Walt and A. M. Fourie. *South African Institute of Mining and Metallurgy Journal*, v. 57, July 1957, p. 709-723.

A technique for testing such suspensions and a method of evaluating the results in terms of absolute viscosity units.

18409 Furnace Makes Strong Ore Pellets. *Steel*, v. 141, Sept. 23, 1957, p. 128 + 1 page.

A combination grate and kiln design for greater efficiency in pelletizing taconite.

18410 Symposium on the Reprocessing of Irradiated Fuels, Held at Brussels, Belgium, May 20-25, 1957. Book I-III. 1165 p. 1957. U. S. Atomic Energy Commission, Oak Ridge, Tenn. (TK9360 Un3.1s)

Papers on aqueous reprocessing, auxiliary processes, disposal of plant effluents, non-aqueous processing, and engineering and economic factors.

18411* (Russian.) Kinetics of the Flotation Process Carried on a Commercial Scale. **O kinetike promyshlennogo flotatsionnogo protsessa.** R. A. Frumkina. *Tsvetnye Metally*, v. 30, no. 8, Aug. 1957, p. 34-37.

Flotation of oxidized lead ore of complex composition. Results indicate that rate of flotation of sulfide-oxide minerals as well as rate of collective flotation of sulfide minerals is given by a second order equation.

18412* (Russian.) The Recovery of Molybdenum and Rhenium From the Mother Liquor When Producing Calcium Molybdate. **Doizvlechenie molibdena i reniia iz matochnykh rastvorov proizvodstva molibdata kal'tsiia.** V. G. Kovyrshin and V. K. Apollonov. *Tsvetnye Metally*, v. 30, no. 8, Aug. 1957, p. 67-73.

Recovery of Mo and Re by a simple method of precipitation permits an increase in the output of potassium perrhenate ($KReO_4$) to 40% and Mo to 0.7-1%.

18413 Low-Temperature Chlorination of Columbium-Bearing Titanium Minerals. V. A. Nieberlein. *U. S. Bureau of Mines, Report of Investigations* 5349, July 1957, 15 p. (TN21 Un3r)

An extractive process applicable to sub-marginal Ti deposits consists of reducing the mineral concentrate with coke at high temperature to form a carbide-suboxide sinter, followed by chlorination in the 400-500 C range and fractional condensation of the chloride.

18414* (Polish.) A Theoretical Approach to the Process of Flotation. **Próby teoretyczneqo ujęcia procesu flotacji.** Andrzej Pomianowski and Janina Czubak-Pawlikowska. *Wiadomosci Chemiczne*, v. 11, nos. 4-5, Apr.-May 1957, p. 233-273.

Historical survey. Flotation in laboratory apparatus. Foamless flotation. The role of moisture. Compositions of reagents. Collectors, activators, and depressors. Electrical capillarity. Electrokinetic phenomena.

PHYSICS

18415 Ray Theory Solution for the Sound Intensity in Water Due to a Point Source Above It. A. A. Hudimac. *Acoustical Society of America, Journal*, v. 29, Aug. 1957, p. 916-917.

For a given height of source and depth of point of observation, the intensity and lateral range are given by a pair of parametric equations in terms of the angle of incidence. An example is given for which iso-intensity lines are plotted. A striking feature is the way in which intensity increases appreciably with depth.

18416 Wedge-Shaped Acoustic Horns for Underwater Sound Applications. C. M. McKinney and W. R. Owens. *Acoustical Society of America, Journal*, v. 29, Aug. 1957, p. 940-947.

Results of an experimental investigation of wedge-shaped acoustic horns used in conjunction with line hydrophones. Characteristic features of the horns are moderate directivity with minor lobes at least 40 db below axial response. The horns which are constructed from Al planes covered with cellular rubber or Corprene, are simple devices and very easy to construct.

18417 Comparison of Experimental Underwater Acoustic Intensities of Frequency 14.5 kc With Values Computed for Selected Thermal Conditions in the Sea. F. H. Sagar. *Acoustical Society of America, Journal*, v. 29, Aug. 1957, p. 948-965.

18418* (English.) **A New Approach to the Problem of Reflection From a Rough Surface.** Petr Beckmann. *Acta Technica*, v. 2, no. 4, 1957, p. 311-355.

Development of a statistical theory giving the probability distribution of the field scattered into any given direction by a rough surface of specified statistical properties.

18419* (French.) A Study of the Diffraction of the 4.2°K Neutrons of the Antiferromagnetic Structure of $FeCl_2$. **Étude par diffraction de neutrons à 4,2°K de la structure anti-**

ferromagnétique de Cl_2Fe. André Herpin and Pierre Mériel. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 650-653.

A study of the magnetic structure of $FeCl_2$ and of its modifications in the presence of a field.

18420* (French.) Paramagnetic Study of $5Fe_2O_3 \cdot 3M_2O_3$ Ferrites With M=Gd, Dy, Er. **Étude paramagnétique des ferrites $5Fe_2O_3$, $3M_2O_3$, avec M=Gd, Dy, Er.** Roland Aléonard and Jean Claude Barbier. *Comptes Rendus*, v. 245, Aug. 19, 1957, p. 831-834.

Thermal variation, above the Curie point, of the paramagnetic capacity of ferrites of the garnet type. Results were interpreted by the ferromagnetic theory of L. Néel.

18421* (Russian.) The Luminescence of Trivalent Uranium. **Liuminestsentsiia trekhvalentnogo urana.** L. N. Galkin and P. P. Feofilov. *Doklady Akademii Nauk SSSR*, v. 114, no. 4, June 1, 1957, p. 745-747.

Luminescence spectrum is situated in the infra-red region close to 2.0-2.5μ.

18422 Fine-Particle Magnets. T. O. Paine, L. I. Mendelsohn, and F. E. Luborsky. *Electrical Engineering*, v. 76, Oct. 1957, p. 851-857.

The permanent-magnet properties of fine particles are summarized and compared with those predicted on a theoretical basis.

18423 Time and Space Temperature Distribution in a Sphere With an Intermittent Constant Heat Source. J. F. Heyda. *General Electric, Atomic Products Division (U. S. Atomic Energy Commission)*, APEX-321, Aug. 1957, 20 p. (UF767 Un3.1ap Contin.)

Mathematical analysis.

18424* (Russian.) Proceedings of the Fifth Conference on Luminescence. (Crystalline Phosphors). **Materialy V soveshchaniia po liuminestsentsii (kristallofosfory).** *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, no. 5, May 1957, p. 643-784 + 1 plate.

Fifty-five papers on theory, materials, properties, and applications.

18425 Electron Mirror Microscopy of Magnetic Domains. Ludwig Mayer. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 975-983.

Deals with the feasibility of electron mirror microscopy for the pictorial representation of magnetic properties in general, and of magnetic domain patterns in particular.

18426 Multiple Shock Production. W. E. Drummond. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 998-1001.

A dynamic theory is developed for the explosive production of multiple shocks in metals which undergo a phase transition. In addition to the formation of two compressive shocks, it is found that a rarefaction shock is also produced which will overtake one of the compressive shocks.

18427 Oblique Interference Filter for Nonparallel Light. M. J. Irland and V. L. Lindberg. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 780-782.

Narrow-band multilayer transmission filters for use in an oblique position were made to exhibit substantially uniform peak transmittance for all rays in a strongly converging beam.

18428 $^5S_2^o$ Term of Neutral Germanium. K. L. Andrew and K. W. Meissner. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 850-852.

The discovery of two new Ge lines at λ 2467.368 A and λ 2416.505 A led to the recognition of the missing $4s4p^3$ $^5S_2^o$ term of Ge I.

18429 New Atomic Energy Levels in the Mn II Spectrum. Laura Iglesias. *Optical Society of America, Journal*, v. 47, Sept. 1957, p. 852-857.

18430 (English.) **Anisotropy of Colour Centres in Alkali Halides.** C. Z. van Doorn. *Philips Research Reports*, v. 12, Aug. 1957, p. 309-323.

18431 The Effects of Radiation on the Near Infra-Red Absorption Spectrum of α-Quartz. E. W. J. Mitchell and J. D. Rigden. *Philosophical Magazine*, v. 2, ser. 8, Aug. 1957, p. 941-956.

The variation of the absorption strength and spectrum in the region of 3μ has been determined for different specimens of crystalline quartz and for X-ray, electron, and pile irradiated crystals. Possible defect axis directions which could give the observed anisotropic ratios are discussed.

18432 An X-Ray Study of Neutron Irradiated Lithium Fluoride. R. E. Smallman and B. T. M. Willis. *Philosophical Magazine*, v. 2, ser. 8, Aug. 1957, p. 1018-1026.

Isolated defects predominate at low doses, but these cluster to form large defects at doses higher than about 10^{17} neutrons/cm^2. With the exception of some small-angle scattering all the X-ray effects anneal out in the range 400 - 500 C. This residual scattering is interpreted as that associated with gas bubbles.

18433 Electron Diffraction From Crystals Containing Stacking Faults. I. M. J. Whelan and P. B. Hirsch. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1121-1142.

The dynamical theory of electron diffraction is applied to the case of a plate-like crystal containing a stacking fault. The effect of the fault is to produce a phase difference in the electron waves diffracted by the two parts of the faulted crystal.

18434 Ergodic Theorem for Interacting Systems. H. Ekstein. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 333-336.

18435 Imprisonment of Resonance Radiatoin in a Gaseous Discharge. P. J. Walsh. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 338-344.

Particle balance equation for the density of resonance atoms; imprisonment time of the resonance radiation; approximate solutions; exact solution computed to first order.

18436 Production of High-Energy Plasmas by Magnetically Driven Shock Waves. A. C. Kolb. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 345-350.

High-voltage discharges (5-100 kv.) with peak currents in 0.3 to 5 microseconds were used to produce shock waves in deuterium plasmas. The discharge is struck in a transverse magnetic field and the resultant Lorentz force drives the plasma out of the region of the discharge into a quartz side arm.

18437 Relaxation of a System of Particles With Coulomb Interactions. W. M. MacDonald, M. N. Rosenbluth, and Wong Chuck. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 350-353.

Time required for relaxation of distribution in neighborhood of average energy was found to agree with the self-collision time defined by Spitzer. For the distribution to become Maxwellian throughout range from zero energy to several times the average energy was found to be nearly ten times the self-collision time.

18438 Theory of the Specific Heat of Superconductors Based on an Energy-Gap Model. Newton Bernardes. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 354-357.

General formulas are developed involving two parameters which describe the approximate shape of the gap. Detailed calculations are presented for two different sets of values of these parameters.

18439 Effective Gyromagnetic Ratio for Triangular Ferrimagnetic States. A. Eskowitz and R. K. Wangsness. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 379-380.

18440 Effect of Low-Temperature Plastic Deformation Upon the Optical Properties of Alkali Halides. G. Chiarotti. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 381-387.

Optical absorption spectrum of KBr and KI crystals, which were plastically deformed at low temperature, were observed in the region of the α band in order to detect single-ion vacancies generated by moving dislocations.

18441 Application of the Ising-Bethe Theory of the Susceptibilities of the Polymorphic Forms of MnS. Peter J. Wojtowicz. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 429-430.

The susceptibilities of the three polymorphic forms of MnS can be correlated with the same indirect exchange mechanism as that required to explain the observed magnetic structures. Some semiquantitative information was obtained on the Mn-S-Mn indirect exchange interaction.

18442 Theory of Cyclotron Resonance in Metals. V. Heine. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 431-437.
Surface impedance is deduced by using the "ineffectiveness concept" of Pippard.

18443 Selection Rules for the Absorption of Polarized Electromagnetic Radiation by Mobile Electrons in Crystals. Mendel Sachs. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 437-445.
Group-theoretical methods are employed to obtain the selection rules. Considers the single-valued and double-valued groups appropriate to several symmetry points in the reduced zones of simple-cubic, face-centered-cubic, body-centered-cubic, and hexagonal-close-packed lattice symmetries.

18444 Distortions of Magnetic Resonances by Additional and Excessive Oscillatory Fields. H. R. Lewis, A. Pery, W. Quinn, and N. F. Ramsey. *Physical Review*, v. 107, ser. 2, July 15, 1957, p. 446-449.
Theory underlying effect is given and the results of experiment verifying the theory are presented. A distortion of molecular beam resonances occurring under certain circumstances when oscillating fields of excessive magnitude are used is described, and some experimental work is summarized.

18445 Nonisothermal Flow of Helium II Film. K. L. Chopra and J. B. Brown. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 915-916.
When cooled by direct pumping on the film, flow is stopped with a cooling of about one millidegree. When cooling is by contact with a cold reservoir, however, there is no effect on the flow rate up to 40 millidegrees change.

18446 Newtonian Development of the Dynamical Properties of Ionized Gases of Low Density. E. N. Parker. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 924-933.

18447 Relativistic Effects in the Cohesive Energies of the Alkali Metals. Joseph Callaway, Roger D. Woods, and V. Sirounian. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 934-939.
The relativistic corrections to the cohesive energies are studied for Cs using perturbation theory and the quantum defect method.

18448 Hyperfine Structure of Paramagnetic Ions. V. Heine. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1002-1003.

18449 α^5 Corrections to the Hyperfine Structure of the 1S and 2S States of Hydrogen. Marvin H. Mittleman. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1170-1180.

18450 Convergent Schrödinger Perturbation Theory. Gerald Spiesman. *Physical Review*, v. 107, ser. 2, Aug. 15, 1957, p. 1180-1192.
A formulation of Schrödinger perturbation theory is developed that gives a unified treatment of non-degenerate and degenerate cases, is unique, and has a nonzero radius of convergence under very general conditions.

18451* (English.) **Rotational Lattice Vibration in Complex Crystals. II. Vibrational Modes in Optical Branches and Interaction With a Conduction Electron. III. Vibrational Frequencies in Cubic $NaClO_4$ Crystals.** Sumitada Asano and Yasuo Tomishima. *Physical Society of Japan, Journal*, v. 12, Aug. 1957, p. 890-908.

18452* (English.) **Electronic States of the *F*-Center in Lithium Fluoride. I-II.** Tadanobu Kojima. *Physical Society of Japan, Journal*, v. 12, Aug. 1957, p. 908-928.

18453 Penetration by High-Speed Metallic Jets. Sampooran Singh. *Physical Society, Proceedings*, v. 70, no. 453B, Sept. 1957, p. 867-879.
Attempts to correlate theoretically the various phenomena relating to jet formation and penetration into metallic tragets by lined cavity charges on the basis of a simple modification of the non-steady state hydrodynamic theory.

18454 Waves in a Plasma in a Magnetic Field. Ira B. Bernstein. *Princeton University (U. S. Atomic Energy Commission)*, NYO-7897, Apr. 1957, 41 p. (UF767 U3ny Contin.)
The small oscillations of a fully ionized plasma, in which collisions are negligible, in a constant external magnetic field, is treated by the Laplace transform method.

18455 Exact Non-Linear Plasma Oscillations. Ira B. Bernstein, John M. Greene, and Martin D. Kruskal. *Princeton University (U. S. Atomic Energy Commission)*, NYO-7898, June 1957, 19 p. (UF767 Un3ny Contin.)
The problem of a one-dimensional stationary non-linear electrostatic wave in a plasma free from interparticle collisions is solved exactly by elementary means. By adding appropriate numbers of particles trapped in the potential energy troughs, essentially arbitrary travelling wave solutions can be constructed.

18456 Effects of Ionizing Radiations on Solids. I. Physical Background. M. Daniels and J. Weiss. *Research*, v. 10, Sept. 1957, p. 341-344.
General discussion of electric conductivity, Hall effect, microwave resonance absorption, light absorption in alkali halides, and recombination processes. (To be continued.)

18457* Developments in Catadioptric Telephoto Systems. Frank G. Back. *Research Council of Israel, Bulletin*, v. 5C, June 1957, p. 319-323.
Describes combinations of lenses and mirrors by which it is possible to produce objectives, especially telephoto systems of lightweight and small physical dimensions, with an excellent image quality.

18458* (English.) **The Viscosity of Argon, Nitrogen and Air at Pressures up to 800 KG/CM^2.** Tadashi Makita. *Review of Physical Chemistry of Japan*, v. 27, no. 1, 1957, p. 16-21.
Viscosity is measured at 25, 50, 75, 100, and 150 C for argon, and at temperatures up to 200 C for N and air, by a rolling-ball method.

18459 Low-Field Nuclear Magnetic Resonance Spectrometer. R. W. Mitchell and M. Eisner. *Review of Scientific Instruments*, v. 28, Aug. 1957, p. 624-628.
A spectrometer was constructed and its performance at 12 and 43 gauss is discussed. A twin-T bridge and a synchronous detector are employed for the nuclear resonance detection. Measurements for which this instrument is suited are described and some results are given.

18460 Colour Centres in Irradiated Diamonds. I. C. A. Coulson and Mary J. Kearsley. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 433-454.
The absorption spectrum of an isolated vacancy in an otherwise perfect diamond lattice was determined. The concept of a defect molecule is introduced.

18461 The Supercooling Effect in Superconductors Close to the Transition Temperature. T. E. Faber. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 531-546.
Ideal supercooling has now been accurately measured for Al, In, and Sn.

18462 The Science of Engineering Materials. J. E. Goldman, editor. 528 p. 1957. John Wiley & Sons, New York. (TA403 G56s)
Applies basic principles of solid state physics to the explanation of properties of materials. Provides the necessary background in modern physics and offers an analysis of the general scope and terminology of the solid state. Covers metals, alloys, semiconductors, dielectrics, polymers, and glass.

18463 Plasmoids. Winston H. Bostick. *Scientific American*, v. 197, Oct. 1957, p. 87 + 6 pages.
Properties of plasma (a gas composed of electrons and ions). Possible use for harnessing thermonuclear power.

18464 Solid State Physics. Advances in Research and Applications. Frederick Seitz and David Turnbull, editors. v. IV. 540 p. 1957. Academic Press, New York. (QC125 So44)
Consists of treatises on ferroelectrics and antiferroelectrics, theory of mobility of electrons in solids, the orthogonalized plane-wave method, bibliography of atomic wave functions, and techniqeus of zone melting and crystal growing.

18465* (Russian.) Investigation Into Thermal Capacity C_v of Water and Water-Steam Near the Boundary Curve, Including the Critical Region. **Issledovanie teploemkosti C_v vody i vodianogo para vblizi pogranichnoi krivoi, vkliuchaia kriticheskuiu oblast'.** Kh. I. Amirkhanov and A. M. Kerimov. *Teploenergetika*, v. 4, no. 9, Sept. 1957, p. 68-72.

Method of determination of thermal capacity C_v of water and water-steam at high pressures and temperatures. Detection of critical region for the state of water at which thermal capacity C_v continuously changes passing from the two-phase into the single-phase state. Experimentally derived values of thermal capacity.

18466 Properties of an Ionized Gas of Low Density in a Magnetic Field. III. Allan N. Kaufman and Kenneth M. Watson. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-4861, Mar. 1957, 26 p. (UF767 U3u Contin.)

Development of hydrodynamic equations.

18467* (Russian.) Relation Between Intermolecular and Intramolecular Vibrations in Crystals. **Sviaz' mezhmolekuliarnykh i vnutrimolekuliarnykh kolebanii v kristalle.** N. N. Porfir'eva. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 33, no. 7, July 1957, p. 47-52.

Model of a molecular crystal with semi-rigid molecules; conditions for separation of intermolecular and intramolecular vibrations; a two-dimensional lattice of C_{4v} symmetry.

See also: **17222** (piezoelectric properties of $BaTiO_3$); **17270** (heat capacity of gases); **17764** (frequency-time standard); **17924** (measurement of transparency of sheet materials).

PLASTICS

18468* (Russian.) Synthesis and Polymerization of Alkoxystyrenes. **Sintez i polimerizatsiia alkoksistirolov.** G. S. Kolesnikov and G. M. Pogosian. *Akademiia Nauk Armianskoi SSR, Izvestiia*, v. 10, no. 2, 1957, p. 131-142.

Synthesis of 13 alkoxystyrenes is described.

18469 Organic Reactions Under High Pressure. I. The Polymerization of Styrene. II. The Polymerization of Allyl Acetate. III. The Decomposition of Benzoyl Peroxide. Cheves Walling and Joseph Pellon. *American Chemical Society, Journal*, v. 79, Sept. 5, 1957, p. 4776-4788.

18470* The Vicatt Softening Point Test for Plastics. C. E. Stephenson and A. H. Willbourn. *ASTM Bulletin*, 1957, no. 224, Sept., p. TP148-TP151.

Identation test is carried out under conditions of uniformly rising temperature.

18471 Relationships Between Electrical and Mechanical Properties of Epoxy Plastics. John Delmonte. *ASTM Bulletin*, 1957, no. 224, Sept., p. TP152-TP155.

When adequate correlations are established, electrical parameters could be used to observe mechanical changes, providing, in effect, a nondestructive test.

18472* (German.) The Structural Analysis of Hydrocarbon Polymers. **Strukturanalyse von Kohlenwasserstoffpolymeren. II.** C. Boelhouwer, E. J. Mouton, P. van der Wal, and H. I. Waterman. *Brennstoff-Chemie*, v. 38, Aug. 1957, p. 241-242.

Analysis of the polymers of propene and *n*-butene-1. Results of the direct method in evaluating the ring content, compared with those of some physical methods. An improved ring analysis is proposed.

18473 Foamed-In-Place Techniques With Sebalkyd and Flexalkyd Resins. A. C. Cornwell, D. B. V. Parker, and L. N. Phillips. *British Plastics*, v. 30, Sept. 1957, p. 392-397.

Foam structure and foaming techniques; accelerators; parting agents; skin adhesion; formulations; prefabricated alkyds.

18474 Accelerated Fatigue Testing of Polymethyl Methacrylate. J. M. Zarek. *British Plastics*, v. 30, Sept. 1957, p. 399 + 4 pages.

Prot's "progressive load" method was successfully used. The hysteresis loss is high in polymethyl methacrylate. This, together with the low heat conductivity of the material, means that rapid cyclic stressing gives an appreciable temperature rise of the specimen, giving a wide range for the fatigue limit.

18475* (English.) **A Thermistor Method for the Determination of Velocity Coefficients of Vinyl Polymerization. V. The Effect of the Bulk Viscosity on the Velocity of Vinyl Polymerization.** Hajime Miyama. *Chemical Society of Japan, Bulletin*, v. 30, July 1957, p. 459-464.

18476 The Kinetics of Catalytic Polymerisations. VI. Polymerisations Catalysed by the Chloroacetic Acids. VII. Kinetics of the Polymerisation of Styrene Catalysed by Di- and Tri-Chloroacetic Acid. VIII. The Constitution of Polystyrene Formed by Di- and Tri-Chloroacetic Acid Catalysis. IX. The State of the Chloroacetic Acids in Solution. X. The Mechanism of the Polymerisation of Styrene Catalysed by Chloroacetic Acids. C. P. Brown and A. R. Mathieson. *Chemical Society, Journal*, Aug. 1957, p. 3608-3639.

18477 The Kinetics of Ionic Polymerisation. VII. The Polymerisation of Alkyl Vinyl Ethers With the Boron Trifluoride-Ether Complex. J. D. Coombes and D. D. Eley. *Chemical Society, Journal*, Aug. 1957, p. 3700-3707.

18478 Some New Chemical and Physical Aspects of Polyester Resin Technology. B. T. Hayes, W. J. Read, and L. H. Vaughan. *Chemistry & Industry*, 1957, no. 35, Aug. 31, p. 1162-1170.

Covers polyester resin-bonded glass-fiber applications.

18479* (English.) **Degradation of Vinylidene Chloride-Vinyl Chloride Copolymers in Cyclohexanone Solution.** Z. Menčík and J. Láníková. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 3, June 1957, p. 879-883.

Degradation was traced to substances formed spontaneously in cyclohexanone on standing in air. For viscometric evaluation of such copolymers, the cyclohexanone solutions can be protected from degradation by minute additions of *p*-benzoquinone.

18480* Isocyanate-Resin-Coated Elastomeric Insulation. Herbert G. Steffens. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 113-115.

Available as sleeving and tape, this new material offers advantage of flexibility while retaining original high levels of physical and dielectric properties.

18481* Evaluation Tests for Epoxy Casting Systems. Mark V. Goodyear and James P. Hornburg. *Electrical Manufacturing*, v. 60, Sept. 1957, p. 125-129.

A heat-aging test method is used.

18482 Glass Reinforced Plastics. Phillip Morgan, editor. 2nd Ed. 276 p. 1957. Philosophical Library, New York. (TP986 M82g2)

A series of articles dealing with glass and resin raw materials, current fabrication techniques, and problems of specialized applications.

18483* (Russian.) Synthesis and Polymerization of *p*-Tretiary Butylphenylmethacrylate. **Sintez i polimerizatsiia *p*-tretichnogo butilfenilmetakrilata.** M. M. Koton, T. V. Sheremet'eva, and M. G. Zhenevskaia. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 7, July, p. 826-827.

Obtained by the reaction $C_{10}H_{14}O + C_2H_3COCl = C_{14}H_{18}O_2$ as a crystalline substance, soluble in organic solvents.

18484 Dielectric Strength of Polyethylene at 3300 Megacycles. Herman Farber and John W. E. Griemsmann. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 1002-1005.

Values found are 16.8 kv/mil, 13.1 kv/mil, and 6.0 kv/mil at 26, 57, and 95 C respectively.

18485 Electric Breakdown and Conduction Through Mylar Films. Y. Inuishi and D. A. Powers. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 1017-1022.

Direct current breakdown studies on Mylar film show that defects cause a decrease in dielectric strength with decreasing film thickness at room temperature but not at −180 C. The breakdown at defects is associated with moisture content.

18486 Preparation and Characterization of Polymeric Membranes of Graded Porosity. Harry P. Gregor and Edward Kantner. *Journal of Physical Chemistry*, v. 61, Sept. 1957, p. 1169-1171.

Semi-permeable membranes of graded porosity were prepared by subjecting a homogeneous polyvinylbutyral film to hydrolysis in 4*N* H_2SO_4 at 60 C for varying lengths of time, the porosity increasing with increased time of hydrolysis. Substances of various molecular weights, including urea, sucrose, Rose Bengal G, salmine sulfate and hemoglobin, were examined as regards their rate of diffusion across these membranes.

18487* Precision Viscometry of Polyvinyl Acetate in Toluene. C. A. F. Tuijnman and J. J. Hermans. *Journal of Polymer Science*, v. 25, Sept. 1957, p. 385-401.

Effect of changes in concentration as a result of adsorption onto the walls of the dilution vessels. Average density of the polymer adsorbed is about 0.17 g/ml. Viscosity at low shearing stress is an even function of shearing stress. The intrinsic viscosity is markedly dependent on shear rate.

18488* Effect of pH on Homopolymerizat'on of *N*-Isopropylacrylamide. W. C. Wooten, R. B. Blanton, and H. W. Coover, Jr. *Journal of Polymer Science*, v. 25, Sept. 1957, p. 403-411.

Study of polymerization in aqueous solution using a redox catalyst consisting of ammonium persulfate and sodium bisulfite indicates that the viscosity of the polymer formed is primarily a function of bisulfite ion concentration.

18489* Poly-*n*-Hexyl Methacrylate. IV. Dilute Solution Properties by Viscosity and Light Scattering. Suresh N. Chinai. *Journal of Polymer Science*, v. 25, Sept. 1957, p. 413-427.

18490* Polymers and Copolymers of *N*-1,1-Dihydroperfluoralkyl Acrylamides. Fred W. Knobloch. *Journal of Polymer Science*, v. 25, Sept. 1957, p. 453-464.

Homopolymerization of fluoroacrylamide monomers with benzoyl peroxide readily proceeded both in bulk and in solution. Both liquid and crystalline fluorinated acrylamide monomers polymerized in emulsion with persulfate initiators. All homopolymers were thermoplastics which could be cast to yield clear transparent films. Reactivity ratios were evaluated for the copolymerization of *N*-ethyl-N-1,1-dihydroperfluororbutyl acrylamide with methyl methacrylate.

18491* Surface and Interfacial Monolayers of High Polymers. Martin J. Schick. *Journal of Polymer Science*, v. 25, Sept. 1957, p. 465-478.

Determination of structure of the monomer unit; mechanical properties of surface films; application of an equation of state for linear polymer molecules in films.

18492* (German.) Reciprocal Action Between Polyvinyl Acetate and Plasticizers. **Über die Wechselwirkung zwischen Polyvinylazetat und Weichmachern.** A. Hartmann. *Kolloid-Zeitschrift*, v. 153, Aug. 1957, p. 157-164.

Dielectric measurements were applied to eleven different polyvinylacetate plasticizer systems in order to determine the critical plasticizer concentration.

18493 Designing With Teflon. II. Strength Properties and Effects of Time. III. Thermal, Chemical, Wear, and Electrical Properties. *Machine Design*, v. 29, Sept. 19, 1957, p. 162-167; Oct. 3, 1957, p. 124-131.

A review of properties influencing design of Teflon plastic parts, including strength, stiffness, creep, cold flow, and stress relaxation.

18494* (English.) **Chlorination of Polyacrylic and Polymethacrylic Esters.** G. Smets and J. Fournaux. *Makromolekulare Chemie*, v. 24, no. 2, 1957, p. 133-140.

Ionic and photochemical chlorinations of methyl- and ethylpolyacrylates and of polymethylmethacrylate.

18495* (German.) The Redox-Polymerization of Acroleine in Aqueous Media. **Die Redox-Polymerisation des Acroleins in wässrigem Medium.** Rolf C. Schulz, Harald Cherdron, and Werner Kern. *Makromolekulare Chemie*, v. 24, no. 2, 1957, p. 141-151.

Influence of temperature and concentration of the initiator and of the monomer.

18496 Where to Use Polyester Film. Malcolm W. Riley. *Materials in Design Engineering*, v. 46, Sept. 1957, p. 104-109.

Electrical, mechanical, and decorative applications are reviewed.

18497 Tool Steels for the Moulding of Plastics. C. C. Hanson. *Metallurgia*, v. 56, Sept. 1957, p. 109-114.

Requirements of a mold steel. Characteristics of the various steels available.

18498 Design and Fabrication With Directionally Reinforced Plastics. I. A. L. Donaldson and R. B. Velleu. *Modern Plastics*, v. 35, Oct. 1957, p. 133 + 6 pages.

Properties and typical design applications, including pressure vessels, springs, and fan blades.

18499 New Test for Tool Wear in Machining Thermosets. A. P. Landall. *Modern Plastics*, v. 35, Oct. 1957, p. 143 + 2 pages.

Test consists of drilling a series of holes in molded samples under constant load and determining the difference between the times required to drill the last and first holes.

18500 Cast Mold Cavities. Irwin Lubalin. *Modern Plastics*, v. 35, Oct. 1957, p. 147 + 3 pages.

Utilizing a unique refractory mixture that passes through a rubbery stage before it is cured and does not expand when heated, the Shaw process is capable of making dense, solid castings of almost any intricacy from virtually all castable alloys.

18501 Properties of Polyester-Triallylcyanurate Glass-Reinforced Laminates at Elevated Temperatures. Norman E. Wahl and Harold M. Preston. *Modern Plastics*, v. 35, Oct. 1957, p. 153 + 8 pages.

Evaluation of the resins; preparation and postcure; influence of pigment fillers on cracking; loss of strength due to O; postcuring in an inert atmosphere; investigation of catalysts; effect of overlay sheets on cracking.

18502 Effects of Rates of Straining on Some Tensile Properties of Polyester Film. Charles F. Bersch, Frank L. McCrackin, and Karl F. Plitt. *Modern Plastics*, v. 35, Oct. 1957, p. 171 + 4 pages.

A new method for gathering high-velocity longitudinal impact data was evaluated for use on plastic films. The energy to rupture and the maximum strain at rates of straining of 400,000 to 800,000% per min. were determined on 3-mil polyester film and related to similar data gathered at rates of straining prevailing in static tensile tests.

18503 Effect of Gamma Radiation on Epoxy Plastics. E. L. Colichman and J. D. Strong. *Modern Plastics*, v. 35, Oct. 1957, p. 180 + 4 pages.

The extent to which typical thermally-cured epoxy plastics might be improved by radiation postcuring was investigated.

18504* (English.) **On Some Transition Phenomena in an Aqueous Solution of Polyvinyl Alcohol.** Teruko Soeya and Ryusuke Kono. *Physical Society of Japan, Journal*, v. 12, no. 8, Aug. 1957, p. 950-954.

Measurements of the specific volume, the ultrasonic velocity, and the dielectric constant were carried out over a range of concentration and temperature.

18505 A Note on Single Crystals in Polymers: Evidence for a Folded Chain Configuration. A. Keller. *Philosophical Magazine*, v. 2, ser. 8, Sept. 1957, p. 1171-1175 + 4 plates.

The morphology and orientation of polyethylenes, polyamides, and guttapercha as crystallized from solution was studied with the electron microscope combined with selected area electron diffraction.

18506* (German.) Aging of Soft PVC Sealing Films and Stability of Their Softeners. **Alterung und Weichmacherbeständigkeit von Abdichtungsfolien aus PVC-weich.** K. Lufsky and M. Zöpfel. *Plaste und Kautschuk*, v. 4, Aug. 1957, p. 283-287.

Aging due to weather exposure and biological causes. Plasticizer displacement and erosion.

18507* (German.) High Frequency Heat Sealing of Hard PVC. **Das Hochfrequenzschweissen von Hart-PVC.** G. Hartung. *Plaste und Kautschuk*, v. 4, Aug. 1957, p. 289-296.

Heat sealing of hard PVC is possible with usual frequencies. Sealing time as a function of material thickness. Strength tests. Toughness of the sealed joint. Soft PVC addition. Continuous seam sealing.

18508* (Dutch.) The Structure of Nylon-6 and Other Polyamides. **Structuuronderzoek van nylon-6 en andere polyamiden. II.** J. Ch. F. Kessler. *Plastica*, v. 10, Aug. 1957, p. 540-545.

Influence of processing conditions. Construction of processing machines in relation to heat transfer and mixing. (To be concluded.)

18509 A Theory of Network Formation in Irradiated Polyesters. A. Charlesby. *Royal Society, Proceedings*, v. 241, ser. A, Sept. 10, 1957, p. 495-507.

The radiation doses required for insolubilizing are far lower than would be predicted on the theory of random cross-linking, indicating that the process involved is a chain reaction, acting through double bonds.

18510* Determination of the Flow Properties of Thermoplastic Melts. James M. McKelvey, J. Gavis, and T. G. Smith. *SPE Journal*, v. 13, Sept. 1957, p. 29 + 7 pages.

A review of methods and instruments useful for measuring the flow properties of extremely viscous fluids with particular reference to problems peculiar to thermoplastic melts.

18511* (Russian.) Orientation of High Polymers and Its Effect on Their Physico-Chemical Properties. **Orientatsiia vysokopolimerov i ee vliianie na ikh fiziko-khimicheskie svoistva.** Iu. S. Lipatov. *Uspekhi Khimii*, v. 26, no. 7, July 1957, p. 768-800.

Orientation of amorphous and crystalline polymers. Effects on the mechanical properties. Thermodynamic examination. Effect on sorption properties and phase transitions.

18512* (Russian.) Vinyllactams and Their Polymers. **O vinillaktamakh i ikh polimerakh.** M. F. Shostakovskii and F. P. Sidel'kovskaia. *Vestnik Akademii Nauk SSSR*, v. 27, no. 7, July 1957, p. 45-51.

Vinylation of lactams; catalysts used in the process; properties of vinyllactams and of their polymers. Preparation of N containing vinyl compounds which could find broad application in industry.

18513 Thermal Embrittlement of the More Crystalline Polyethylenes. R. H. Carey, J. A. Snyder, and H. C. Vakos. *Wire and Wire Products*, v. 32, Sept. 1957, p. 998-1000.

It has been found that although creep may be nil, the highly crystalline polyethylenes do embrittle under stress at elevated temperatures. Proper mol. wt. and suitable antioxidant can improve these characteristics.

18514 Nylon in Wire and Cable. A. L. Gibson. *Wire and Wire Products*, v. 32, Sept. 1957, p. 1001 + 3 pages.

Describes the excellent mechanical and chemical properties of "Zytel" which make it particularly effective as a jacketing material.

18515* (Russian.) High-Molecular-Weight Compounds. **Iz oblasti vysokomolekuliarnykh soedinenii. C.** Relation Between the Softening Temperature of Polyamides and Polyethers and Link Structure. **O zavisimosti temperatur razmiagcheniia poliamidov i poliefirov ot stroeniia zvena.** V. V. Korshak, S. V. Vinogradova, and T. M. Frunze. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1600-1611.

18516* (Russian.) Moisture Penetrability of Plasticized Compositions. **Vlagopronitsaemost' plastifitsirovannykh kompozitsii.** Sh. L. Lel'chuk and V. I. Sedlis. *Zhurnal Prikladnoi Khimii*, v. 30, no. 7, July 1957, p. 1041-1049.

Chemical composition of plasticizers and moisture penetrability of plasticized PVC. Aliphatic plasticizers as the most effective agents against the moisture penetrability of polymers.

See also: **17384** (polymerization of styrene); **17479** (addition polymerization); **17790** (world trade in plastics); **18462** (physics of polymers); **18539** (testing methods and equipment).

POLLUTION AND WASTES

18517 Quantitative Determination of Volatile Acids by Paper Chromatography for Application to Sewage Sludge Digestion. Raymond M. Manganelli and Frederick R. Brofazi. *Analytical Chemistry*, v. 29, Oct. 1957, p. 1441-1443.

18518 Regeneration of Waste Pickle Liquor to Produce Ferrous Sulfate Monohydrate. J. S. Atwood, J. S. Joseph, and W. W. Hodge. *Blast Furnace and Steel Plant*, v. 45, Sept. 1957, p. 1018-1023.

Process description; plant experience.

18519 Waste Treatment at Sun Oil's Sarnia Refinery. Harold F. Elkin and Gordon R. Henderson. *Canadian Journal of Chemical Engineering*, v. 35, Oct. 1957, p. 129-134.

Design of treatment plant. Operating results for the sulfide stripping tower and the biological oxidation unit.

18520* Liquid-Liquid Extraction for Ion Exchange Recovery or Treatment of Industrial Wastes. C. J. Lewis. *Industrial Wastes*, v. 2, Sept.-Oct. 1957, p. 137-141.

Ion exchange mechanisms and advantages, disadvantages, and application of the liquid-liquid extraction technique.

18521* One Hundred Best Books for Engineers, Chemists, and Waste Treatment Plant Operators. Harry A. Faber, compiler. *Industrial Wastes*, v. 2, Sept.-Oct. 1957, p. D18-D19.

18522 Treatment and Re-Use of Mill Scale Wastes to Conserve Water and Abate Pollution. Grant A. Pettit. *Iron and Steel Engineer*, v. 34, Sept. 1957, p. 144-151.

18523 Science for Electroplaters. XXVIII. Treatment of Chromate Wastes. L. Serota. *Metal Finishing*, v. 55, Sept. 1957, p. 65 + 3 pages.

Precipitation; sulfide, ferrous sulfate, and SO_2 reduction processes; ion-exchange method.

18524 Molecular Sieves Adsorb Iodine-131 From Air. Morris A. Wahlgren and W. Wayne Meinke. *Nucleonics*, v. 15, Sept. 1957, p. 156 + 2 pages.

Satisfactory decontamination was obtained by use of molecular sieve column.

See also: **18410** (radioactive waste disposal).

RUBBER AND ELASTOMERS

18525* Radiation Gages Provide Automatic Control of Web Thickness. *Automation*, v. 4, Oct. 1957, p. 80-81.

Radiation gaging units regulate application of rubber to both sides of tire fabric.

18526* (French.) Rubber Grafted by Means of Methyl Polymethacrylate. Mechanism of the Grafting Process. **Sur le caoutchouc greffé par le polyméthacrylate de méthyle. Mécanisme de greffage.** Waldemar Kobryner and Albert Banderet. *Comptes Rendus*, v. 245, Aug. 5, 1957, p. 689-692.

Grafting mechanism studied on the product of the emulsion polymerization of methyl methacrylate in the presence of a latex of hevea rubber with the aid of a catalyst of the peroxide type.

18527 New Curing System for Silicone Rubber. M. L. Dunham, D. L. Bailey, and R. Y. Mixer. *Industrial and Engineering Chemistry*, v. 49, pt. 1, Sept. 1957, p. 1373-1376.

Cure is obtained and controlled through pendant alkenyl and methyl groups by means of a peroxide-induced free radical mechanism. Extremely low compression sets, ability to cure thick sections, and carbon black-filled stocks characterize this system.

18528 The Influence of Rubber on the Brittleness and Viscosity of Bituminous Materials. P. Mason, E. N. Thrower, and L. M. Smith. *Journal of Applied Chemistry*, v. 7, Aug. 1957, p. 451-459.

Incorporation of rubber produced a material displaying a marked increase in resistance to deformation, simultaneously with a reduced brittleness at low temperatures.

18529* Proton Magnetic Resonance Studies on Natural Rubber. II. Line Shape and T_1 Measurements. H. S. Gutowsky, A. Saika, M. Takeda, and D. E. Woessner. *Journal of Chemical Physics*, v. 27, Aug. 1957, p. 534-542.

18530* (German.) A Contribution to the Knowledge of High-Elasticity Polymer Vulcanization. **Zur Kenntnis der Vulkanisation hochelastischer Polymerisate. XV.** The Vulcanization of Natural and Synthetic Rubbers by Means of Sulfur in the Presence of Organic Bases. **Die Vulkanisation des Naturkautschuks und der synthetischen Kautschuke durch Schwefel bei Anwesenheit organischer Basen.** Walter Scheele and Martin Cherubim. *Kautschuk und Gummi*, v. 10, Aug. 1957, p. WT185-WT194.

An investigation of the kinetics of the process, with or without ZnO or diphenyl guanidine, as a function of temperature; reaction with different bases at 140 C.

18531* (German.) Something New in the Chemical Analysis of Fillers in Vulcanization. **Neues zur chemischen Analyse von Füllstoffen in Vulkanisaten.** Fr. Glander. *Kautschuk und Gummi*, v. 10, Aug. 1957, p. WT201-WT204.

Carbon black determination by various methods in various vulcanizates in a stream of H_2 at 950 or 550 C. Zinc white determination.

18532 A Guide to Synthetic Rubbers. Malcolm W. Riley. *Materials in Design Engineering*, v. 29, Sept. 1957, p. 129-148.

Data on styrene-butadiene, butyl, nitrile, polysulfide, neoprene, silicone, acrylic, hypalon, urethane, and fluoroelastomers.

18533* (Russian.) The Transformation of Inhibitor in the Oxidation Process of Rubber. **O prevrashcheniiakh ingibitora v protsesse okisleniia kauchuka.** M. A. Salimov, L. G. Angert, A. S. Kuz'minskii, and V. M. Tatevskii. *Moscow. Universitet, Vestnik. Seriia Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii*, v. 12, no. 2, 1957, p. 235-240.

Studies using ultra-violet and infra-red spectroscopy. Presents spectra of phenyl-β-naphthylamine and of extracts from oxidized rubber subjected to oxidation for various times and temperatures.

18534 Cast Urethane Rubber. R. H. Kittner and K. A. Pigott. *Product Engineering*, v. 28, Sept. 1957, p. 68-71.

Run-down on German experience since 1950 with this resilient-yet-hard material includes properties, performance features, and design tips.

18535 Elastomers for Use in Radiation Fields. Robert Harrington. *Rubber Age*, v. 81, Sept. 1957, p. 971-980.

Reactions of elastomers to radiation; cracking of stressed elastomers; post irradiation effects; effect of dose rate.

18536 Permeability of Rubber to Organic Liquids. William J. Mueller. *Rubber Age*, v. 81, Sept. 1957, p. 982-987.

Describes work undertaken to obtain a general picture of some of the factors which affect the permeability rate. Using combinations of three test temperatures, seven organic liquids, and five types of synthetic rubber cured to optimum cure, it was found that permeability increased logarithmically with temperature for every rubber-liquid combination, and permeability was proportional to the square of the solubility of the liquid in the rubber. This permits estimation of the permeability rate under new conditions from existing permeability or solubility data.

18537* Recent Developments in Hardness Testing. A. E. Juve. *Rubber Chemistry and Technology*, v. 30, Apr.-June, 1957, p. 367-379.

18538* Analytical Methods for Calculating Temperatures Inside Rubber Articles During Vulcanization. V. O. Fogel. *Rubber Chemistry and Technology*, v. 30, Apr.-June 1957, p. 757-770. (Translated from *Trudy Moskovskogo Instituta Tonkoi Khimicheskoi Tekhnologii im. M. V. Lomonosova*, 1955, no. 5, p. 66-83.)

18539 Rubber and Plastics Testing Methods and Equipment. F. N. B. Bennett. *Rubber Journal*, v. 133, Sept. 14, 1957, p. 346-348.

Old and new methods and equipment are evaluated. (To be concluded.)

18540* Self Reinforced Elastomers. E. E. Gale. *Rubber and Plastics Age*, v. 38, Sept. 1957, p. 780 + 6 pages.

Chemical, physical, and rheological properties; recent improvements, particularly in handling and mixing characteristics; compounding variables. Applications.

18541* Electronic Pendulum for Evaluating Impact Absorption of Foam Materials. C. S. Wilkinson, Jr. *Rubber World*, v. 136, Sept. 1957, p. 841 + 6 pages.

Mechanical and electrical features of an impact pendulum machine adapted for use in the evaluation of foam materials for shock and vibration absorption applications.

18542* Resorcinol - Formaldehyde Latex Adhesives for Bonding Synthetic Tire Cords. M. I. Dietrick. *Rubber World*, v. 136, Sept. 1957, p. 847-851.

Concentration of the NaOH and composition of the latex used have a pronounced effect on adhesion test values. Concentration of formaldehyde, resorcinol resin, and total solids concentration of the adhesive compound are of importance, but can be varied over a relatively wider range.

18543* (Russian.) Ozonization of Unsaturated Compounds. **Ozonirovanie nepredel'nykh soedinenii. III.** Ozonization of External and Internal Double Bonds in Divinyl Rubber. **Prisoedinenie ozona k vnutrennim i vneshnim dvoinym sviaziam v divinilovom kauchuke.** A. I. Iakubchik, N. G. Kasatkina, and T. E. Pavlovskaia. *Zhurnal Obshchei Khimii*, v. 27, no. 6, June 1957, p. 1487-1489.

See also: **17161** (biosynthesis in kok-saghyz plants); **17591** (chlorinated rubber for paint); **17993** (rubber air springs).

SPACE HEATING AND CONDITIONING

18544* Supply and Exhaust Ventilation for Metal Pickling Operations. George M. Hama. *Air Conditioning, Heating, and Ventilating*, v. 54, Sept. 1957, p. 61-63.

Design data for a push-pull system.

18545* Complete Air Conditioning is Not Expensive. John E. Haines. *Commercial Refrigeration & Air Conditioning*, v. 14, Sept. 1957, p. 37 + 4 pages.

The economics of installing complete air conditioning in both new and existing buildings, including personnel turnover and training problems and initial cost vs. the cost of owning and operating the system.

18546* How to Design an Air Flow System for Warm Air Heating. Edward Dowis. *Commercial Refrigeration & Air Conditioning*, v. 14, Sept. 1957, p. 44 + 5 pages.

An explanation of the basic principles of warm air distribution and how they can be applied to an actual layout.

18547 Dust Control in Foundries. W. B. Lawrie, A. T. Holman, and J. L. Burgess. *Foundry Trade Journal*, v. 103, Sept. 12, 1957, p. 303-307.

Applications of low-volume, high-velocity exhaust ventilation system.

18548 Air Heating Plant in Industry. *Fuel Efficiency*, v. 5, Aug. 1957, p. 358-362.

Design of ducts and other equipment for gas-fired air-heating installations.

18549 Floor Warming in a Modern Factory. *Fuel Efficiency*, v. 5, Aug. 1957, p. 376-377.

Presents details for electrical floor heating.

18550 Estimating Octave Band Levels of Noise Generated by Air-Conditioning Systems. F. B. Holgate and Sidney Baken. *Heating, Piping & Air Conditioning*, v. 29, Sept. 1957, p. 160-166.

18551 Pneumatic or Electronic Control—Which for Heating, Ventilating and Air Conditioning? Harold W. Alyea. *Instruments and Automation*, v. 30, Aug. 1957, p. 1484-1485.

Circuits, advantages and disadvantages of each system are described.

18552 Keep Plant Air Clean—Electronically. *Iron Age*, v. 180, Oct. 3, 1957, p. 100-101.

Electronic air cleaning units are designed to filter out particles smaller than three microns.

18553* A Survey of Air Treatment Systems Use in the Metal-Finishing Industries. Leo Walter. *Metal Finishing, Journal*, v. 3, Sept. 1957, p. 353 + 5 pages.

Types of air filters and air washers.

18554 Distribution of Air Within a Room for Year-Round Air Conditioning. II. Harold E. Straub and Michael Ming Chen. *University of Illinois Engineering Experiment Station Bulletin No.* 442, Mar. 1957, 44 p. (T1 I6b Vis.)

Four different schemes for gaseous diffusion are studied.

See also: **17727** (Peltier refrigerator).

TEXTILES, FIBERS, LEATHER, AND PAPER

18555* Dyeing of Hydrophobic Fibers. I. Effect of Acids and Swelling Agents on the Dyeing of Orlon 42 With an Anionic Azo Dye. John H. Skinkle and Alan A. Denio. *American Dyestuff Reporter*, v. 46, Sept. 23, 1957, p. P706-P708.

Formic acid is recommended for blends containing cellulose fibers. Ammonium thiocyanate, urea, and acetamide proved successful in increasing the exhaustion in an acid dyebath, although these compounds alone had no appreciable effect.

18556 Studies on the Significance of Anionic Chrome in Chrome Tanning Using Radioactive ^{51}Cr. Akira Kawamura and Keizo Wada. *American Leather Chemists Association, Journal*, v. 52, Sept. 1957, p. 476-488.

Anionic complexes may have an accelerating effect.

18557 Complex Equilibria in Chrome Tanning. Thomas C. Thorstensen. *American Leather Chemists Association, Journal*, v. 52, Sept. 1957, p. 489-504.

The problem of the effect of masking salts in chrome tanning is approached from the study of complex equilibria and solutions by means of ion exchange techniques and the study of detanning effects at various pH values.

18558 A Method for the Study of Decay Resistance in Wood Under Controlled Moisture Conditions. D. E. Etheridge. *Canadian Journal of Botany*, v. 35, Sept. 1957, p. 615-618.

Employs a new method of adjusting and controlling moisture content, of sterilizing and inoculating the test pieces.

18559* Germany's Technique of Proofing Against Weather, Washing and Flames. V. Bird. *Fibres, Engineering and Chemistry*, v. 18, Sept. 1957, p. 300-304.

Unique finish gives weatherproof, washproof, and flameproof impregnation to textiles without prejudicing other desirable properties.

18560* Expanding the Use of Wood Residues for Pulp Production. R. M. Samuels. *Forest Products Journal*, v. 7, Aug. 1957, p. 253-255.

Oregon sawmills and veneer plants produced about 2 million tons of unused chippable wood residues and 1.1 million tons were used for fuel in 1953, while pulp production is expected to increase 65% by 1975; hence research is needed to achieve further utilization of wood residues.

18561* Effect of Storage on Phenolic Resins and Their Ability to Stabilize Wood Dimensions. Ray M. Seborg and Harold Tarkow. *Forest Products Journal*, v. 7, Aug. 1957, p. 256-261.

The effect of temperature and length of storage on the apparent increase in degree of polymerization of phenolic resin, and the effect of increased polymerization upon the ability of the resin to impart dimensional stability to wood were studied.

18562 Time Dependence of Mechanical Breakdown in Bundles of Fibers. I. Constant Total Load. Bernard D. Coleman. **II. The Infinite Ideal Bundle Under Linearly Increasing Loads.** Bernard D. Coleman and Donald W. Marquardt. *Journal of Applied Physics*, v. 28, Sept. 1957, p. 1058-1067.

Theory of creep failure of filaments is applied to bundles of filaments.

18563* Light Scattering Studies of Cellulose Solutions in Concentrated Acids. I. Wood Pulp & Cotton Cellulose in Phosphoric & Sulphuric Acids. Pijush Kanti Choudhury. *Journal of Scientific & Industrial Research*, v. 16, sec. B, July 1957, p. 289-294.

Light scattering studies on cellulose solutions in concentrated H_2SO_4 and H_3PO_4 indicated the formation and growth of a large sized and extensively branched polymer of 5-hydroxy methyl furfural during hydrolysis of cellulose.

18564* (German.) Incorporation of Iodine and Thallium in Cellulose Fiber Areas With or Without a Lattice Arrangement; a Contribution to the Study of the Mode of Reaction of Cellulose. **Einlagerung von Jod und Thallium in die gitterungeordneten und gittergeordneten Bereiche von Zellulosefasern; ein Beitrag zur Reaktionsweise von Zellulose.** K. Hess, R. Steinmann, H. Kiessig, and I. Avisiers. *Kolloid-Zeitschrift*, v. 153, Aug. 1957, p. 128-155.

Investigation of the staining of cellulose fibers by means of iodine; X-ray phenomena in fibers with an increasing iodine content. Cellulose-iodine reaction. Effect on the crystalline phase. The cellulose thallium reaction.

18565* Man-Made Fibers. Progress Review and Outlook. Jerome Campbell. *Modern Textiles Magazine*, v. 38, Sept. 1957, p. 51-70.

New trends in rayon, nylon, acetate, acrylics, polyesters, polyethylenes, metallics, and glass fibers.

18566* Tables of Denier Numbers and Filament Counts of U. S. Man-Made Yarns and Fibers. H. George Janner. *Modern Textiles Magazine*, v. 38, Sept. 1957, p. 71-79.

18567* pH Control in Sulphite Pulping. Some Effects on Pulp Quality. O. V. Ingruber. *Pulp and Paper Magazine of Canada*, v. 58, Sept. 1957, p. 161-169.

Quality is strongly affected by the pH level in the cook. For a given cooking schedule, where other factors are kept constant, pulps of different quality can be produced by varying the pH level through pressure adjustments.

18568* The Continuous Dyeing of Secondary Cellulose Acetate, Cellulose Triacetate, and Terylene Polyester Fibre by the Vapocol Process. D. A. Garrett. *Society of Dyers and Colourists, Journal*, v. 73, Aug. 1957, p. 365-374 + 2 plates.

Fabrics are padded with disperse dyes and after being dried, are subsequently immersed in the saturated vapor of trichloroethylene for times up to 60 sec. to fix the dyes on the fibers.

18569* Relation Between Physical State and Rate of Fading of Dyes. G. Baxter, C. H. Giles, and W. J. Lewington. *Society of Dyers and Colourists, Journal*, v. 73, Aug. 1957, p. 386-392.

18570* (Swedish.) Nuclear Power. **Atomenergi.** Torsten Simmons. *Svensk Papperstidning*, v. 60, Aug. 15, 1957, p. 537-548.

Some fundamental aspects of nuclear heat and power with reference to application to the pulp and paper industry.

18571* (English.) **Studies of the Adsorption of Xylan on Cellulose Fibres During the Sulphate Cook. II.** Sven Yllner and Barbro Enström. *Svensk Papperstidning*, v. 60, Aug. 15, 1957, p. 549-554.

18572* (English.) **Investigations of Wood Hemicelluloses. I. Separation of Pulp Hemicelluloses Into Xylan and Glucomannan Fraction.** Brita Immergut and Bengt G. Rånby. *Svensk Papperstidning*, v. 60, Aug. 31, 1957, p. 573-581.

18573* (Swedish.) Weighing Digester Contents by Means of Resistance Strain Gages. **Vägning av kokarinnehåll med trådtöjningsgivare.** Uddo Ullmann. *Svensk Papperstidning*, v. 60, Aug. 31, 1957, p. 584-594.

Different methods for direct weighing of the digester contents are compared.

18574 Symposium on Wood for Marine Use and Its Protection From Marine Organisms. 52 p. 1957. American Society for Testing Materials, Philadelphia. (TA424 Am35s)

Distribution and importance of marine wood borers in the U. S. Marine exposure tests of wood treated with various preservatives. Performance tests of heavy metal compounds as marine borer inhibitors. Relationship between "Limnoria" species and service life of creosoted piling.

18575 Tenth Progress Report on Marine Borer Activity in Test Boards Operated During 1956. Dorothy Brown Wallour, compiler. 153 p. 1957. (TC201 C53p Vis.)

18576 (Finnish.) Present-Day Lignin Research. **Ligninforskningen i detta nu.** Terje Enkvist. *Teollisuuden Keskuslaboratorion Tiedonantoja* 159, 1957, p. 376-383. (TS1080 C33m Contin.)

A survey of research into the constitution of lignin and possibilities of its use for the manufacture of plastics, tanning materials, and other products. Demethylation of the methoxyl groups as well as degradation of the propane side chain is discussed.

18577 (Finnish.) The Present State of Cellulose-Chemical Research. **Selluloosakemiallisen tutkimuksen tämänhetkisestä tilasta.** Hannes Sihtola. *Teollisuuden Keskuslaboratorion Tiedonantoja* 161, 1957, p. 391-400. (TS1080 C33m Contin.)

A survey of recent developments pertinent to the chemical pulp industry.

18578 (Finnish.) Research in the Paper Field Today. **Forskning på pappersområdet i våra dagar.** Lars Nordman. *Teollisuuden Keskuslaboratorion Tiedonantoja* 162, 1957, p. 401-408. (TS1080 C33m Contin.)

Research is primarily directed toward the development of new and faster machines and new paper qualities.

18579 (Finnish.) Research in Chemical Pulping. **Selluloosan valmistustekniikka ja tutkimus.** Juha Alhojärvi. *Teollisuuden Keskuslaboratorion Tiedonantoja* 163, 1957, p. 409-412. (TS 1080 C33m Contin.)

Discussion of effects of scale of experiment on applicability of results to mill operation. Illustrative examples are given.

18580 (Finnish.) On the Methods Used in Board Research at the Finnish Pulp and Paper Research Institute. **Om metodiken inom kartongforskningen vid Centrallaboratorium Ab.** Jaakko Paronen. *Teollisuuden Keskuslaboratorion Tiedonantoja* 164, 1957, p. 413-420. (TS1080 C33m Contin.)

Description of equipment and procedures for studying gloss, smoothness, oil absorption, stiffness, and other characteristics.

18581 (Finnish.) Mechanical Pulping of Today. **Slipmassatillverkningen av i dag.** Georg V. Alfthan. *Teollisuuden Keskuslaboratorion Tiedonantoja* 165, 1957, p. 421-425. (TS1080 C33m Contin.)

Review of developments since World War II in pulp wood, barking, grinding, screening, dewatering, pressing and baling, and process and quality control.

18582 (Finnish.) The Present Stage of Pulp Bleaching. **Nykyinen tilanne valkaisualalla.** Yrjö Hentola. *Teollisuuden Keskuslaboratorion Tiedonantoja* 166, 1957, p. 425-428. (TS 1080 C33m Contin.)

The latest progress in the field is significantly based on the commercial application of chlorine dioxide and peroxides as bleaching agents.

18583 (Finnish.) Chemical Analytical Methods in the Cellulose Field. **Kemiska analysmetoder på cellulosaområdet.** Paul Ålander. *Teollisuuden Keskuslaboratorion Tiedonantoja* 167, 1957, p. 429-434. (TS1080 C33m Contin.)

18584* (Finnish.) On Strength Testing of Chemical Pulp. **Om styrkeprovningsmetoderna för cellulosamassa.** Torsten Ekstam. *Teollisuuden Keskuslaboratorion Tiedonantoja* 168, 1957, p. 435-441. (TS1080 C33m Contin.)

Critical review of methods used in various parts of the world.

18585 (Finnish.) On the Determination of Fiber Length. **Kuitupituuden määrityksestä.** Marja-Sisko Ilvessalo. *Teollisuuden Keskuslaboratorion Tiedonantoja* 169, 1957, p. 443-449. (TS1080 C33m Contin.)

Frequency distribution curve by length, which also characterizes the distribution of fibers by weight, is considered the best fiber length characteristic, if only one expression is used for reporting results.

18586 (Finnish.) Cellulose as a Raw Material for the Chemical Industry. **Selluloosa kemiallisen teollisuuden raaka-aineena.** Ermo Kaila. *Teollisuuden Keskuslaboratorion Tiedonantoja* 170, 1957, p. 451-456. (TS1080 C33m Contin.)

A review of the use of dissolving pulps, the production of man-made fibers and plastics, and the properties of cellulose.

18587* **Man-Made Fibers.** J. B. Goldberg. *Textile Industries*, v. 121, Sept. 1957, p. 113-162.

Presents seven papers on textile techniques in the utilization of synthetic and natural fibers.

18588 Double Yarns. I. The Influence of Twist on the Strength and Certain Other Properties of Two-Fold Yarns. II. The Effects of Differences in Doubling Tension Arising From Changes of Traveller Size, Spindle Speed, and Ring Diameter. III. The Effects on Their Physical Properties of Differences of Singles Twist, Doubling Twist, Direction of Doubling, Traveller Weight, and Spindle Speed. A. F. W. Coulson and G. Dakin. **IV. The Effect of Twist and Structure on the Physical Properties of Some Manifold Yarns. V. The Effect of Twist on Some Physical Properties of an 80/s/2/3 Thread Twisted Z/Z/S.** G. Dakin. *Textile Institute, Journal (Transactions)*, v. 48, July-Aug. 1957, p. T203-T332.

18589* **1957 Man-Made-Fiber Table.** W. A. B. Davidson. *Textile World*, v. 107, Sept. 1957, p. 101-120.

Data on production, consumption, prices, and properties.

18590* **Fluid Beds Speed Up Fabric Processing.** *Textile World*, v. 107, Sept. 1957, p. 159 + 2 pages.

A new conception in drying media has been evolved from the catalytic processes used in oil refining. Called a fluid bed, the system uses heated sand or glass particles supported on a column of air to remove moisture from fabrics, speed up dye fixation on hydrophobic fibers, and cure resin finishes on cellulosic fabrics.

18591* (Russian.) Technology of the Production of Nitrone (Nitrilone) Fibers From Polyacrylonitrile. **K voprosu o tekhnologii poliakrilonitrilovogo volokna nitron (nitrilon).** E. S. Roskin. *Zhurnal Prikladnoi Khimii*, v. 30, no. 7, July 1957, p. 1030-1041.

Static polymerization of acrylonitrile in the textile industry and production of Nitrone (Nitrilone) fibers from it. Step by step description of the process.

WELDING AND JOINING

18592 The Production Man's Guide to Joining Welded Steel Tubing. *American Machinist*, v. 101, Sept. 9, 1957, p. 149-164.

Shows 116 different ways to join a piece of welded steel tubing to another tube or to other parts. Includes both welded and mechanical joints.

18593* (Russian.) Effect of the Flux Composition on Distribution of Phosphorus Between the Slag and Weld Metal. **O vliianii sostava fliusa na raspredelenie fosfora mezhdu shlakom i metallom shva.** V. V. Podgaetskii and L. A. Pozniak. *Avtomaticheskaia Svarka*, v. 10, no. 4, July-Aug. 1957, p. 13-18.

Experiments conducted with automatic and semiautomatic methods show that the nature of distribution of P depends on the form of O in the slag. When O is in the form of ions the dephosphorization of liquid metal takes place. However when O is present as complex oxyaluminum or oxysilicon ions the process is reversed and P goes into the liquid metal.

18594* (Russian.) Metal Transfer in the Arc and Depth of Penetration Into the Basic Metal in Gas Shielded Arc Welding. **Perenos metalla v duge i proplavlenie osnovnogo metalla pri svarke v srede zashchitnykh gazov.** A. V. Petrov. *Avtomaticheskaia Svarka*, v. 10, no. 4, July-Aug. 1957, p. 19-28.

Experimental investigation of transfer of metal particles, heat distribution, and shape of cross section of the weld in argon shielded arc welding of steel with consumable electrode.

18595* (Russian.) Some Questions About Formation of Hot Cracks in Electro-Slag Welding. **Nekotorye voprosy obrazovaniia kristallizatsionnykh treshchin pri elektroshlakovoi svarke.** S. A. Ostrovskaia. *Avtomaticheskaia Svarka*, v. 10, no. 4, July-Aug. 1957, p. 33-47.

Investigation of the nature of the location of hot cracks in the weld metal. Susceptibility to cracking depends on chemical composition of the joint and characteristics of the melting pool.

18596* (Russian.) Desulfurization of Melting Pool in Electric-Arc and Electro-Slag Welding. **Obesserivanie svarochnoi vanny pri elektrodugovoi i elektroshlakovoi svarke.** Iu. A. Sterenbogen, Iu. V. Latash, B. I. Medovar, and Iu. N. Zaitsev. *Avtomaticheskaia Svarka*, v. 10, no. 4, July-Aug. 1957, p. 71-74.

Fluxes based on KF, NaF, and Ca and Al oxides provide intensive desulfurization of the molten metal in electroslag and electric-arc welding. Application of these fluxes increases the susceptibility of welds and built-up metal to formation of hot cracks.

18597* The Welding of Aluminium Tanks for Experimental Reactors. J. F. Lancaster. *British Welding Journal*, v. 4, Aug. 1957, p. 354-360.

Methods of overcoming specific problems, such as the welding of dissimilar and variable thicknesses of pure Al plate, and cracking in 99.8% purity Al fillet welds.

18598* The Welding of Uranium. J. R. C. Gough and D. Roberts. *British Welding Journal*, v. 4, Sept. 1957, p. 393-403.

Uranium can be satisfactorily welded by the argon-arc process, and the weld metal is stronger and harder, but less ductile than the parent material. The maximum penetration obtainable is of the order of 3/16 in. Metal-arc welding is at present unsatisfactory, but continuous inert-gas-shielded metal-arc welding may be feasible. Uranium in the form of thin sheets is readily joined by resistance spot welding. The susceptibility of uranium to hot cracking is very low.

18599* Welding of Heat-Exchanger Elements in a Fast Breeder Reactor. S. H. Griffiths. *British Welding Journal*, v. 4, Sept. 1957, p. 403-411.

Welding procedures and equipment for tubular heat-exchangers. Radiographic examination and gas testing of all joints.

18600* The Welding of Zircaloy-2. J. G. Purchas, D. R. Harries, and H. Cobb. *British Welding Journal*, v. 4, Sept. 1957, p. 412-421.

Conditions were established for welding experimental Zircaloy-2 fuel elements by the tungsten inert-arc process, such that sound welds having good corrosion resistance in high-temperature and high-pressure water can be made.

18601* Weldability of *ND* Steels. L. Reeve. *British Welding Journal*, v. 4, Sept. 1957, p. 425-432.

Results of (controlled thermal severity) and cracking tests on C-Mn steels.

18602* Petrol-Electric Welding Sets. G. Schlüsselburg. *Brown Boveri Review*, v. 44, June-July 1957, p. 251-259.

Describes generators, engines, and mountings for stationary, push-cart, and trailer types, with ratings of 250, 375 and 500 amps.

18603* The Problems of Arc Welding Heavy Steel Objects. A. Lüthy and A. Schmid. *Brown Boveri Review*, v. 44, June-July 1957, p. 260-270.

Arc welding fabrication techniques.

18604 Ultrasonic Iron Solders Aluminum. Thomas J. Scarpa. *Electronics*, v. 30, Oct. 1, 1957, p. 168-169.

Oxide layer on metal is removed by ultrasonic iron tip, driven at 20 kc. by piezoelectric transducer energized by Hartley oscillator and two stages of amplification. The sonic field abrades the surface of the metal while molten solder forms an alloy bond before further oxidation can take place.

18605* (Spanish.) The Electrode and Its Coating. **El electrodo y su cubierta.** *Fusion de Metales*, v. 19, July-Aug. 1957, p. 15-18.

Different types of electrode coatings including cellulosic, rutile, lime, or lime-titanium. Purpose of the coating; compositions. Electrode specifications.

18606 Paste Filler Metal Gives Dip Brazing a Boost. A. M. Setapen. *Iron Age*, v. 180, Sept. 12, 1957, p. 136-138.

A powdered Al filler metal cuts assembly time and substantially increases uniformity of production joints. It is applied as an aqueous paste and brazed in a flux bath.

18607* (Russian.) Experimental Study of the Heating of Bars During Electric Resistance Butt Welding. **Eksperimental'noe issledovanie nagreva sterzhnei tokom pri svarke vstyk soprotivleniem.** A. I. Pugin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 7, July, p. 14-23.

As a result of experiments a new method of calculation of temperature distribution along the rod length during welding is established.

18608* New Powdered Alloy Simplifies Aluminum Brazing. A. M. Setapen. *Modern Metals*, v. 13, Sept. 1957, p. 40 + 2 pages.

Easy to apply as an aqueous paste, "Handy Alumibraze" eliminates tedious preplacing of filler metal preforms in assemblies to be brazed. Joints are strong and resistant to fatigue and corrosion.

18609* (German.) The Welding of High Strength Structural Steels. **Die Schweissung von Baustählen mit hoher Festigkeit.** K. L. Zeyen and H. Schwarz. *Oerlikon Schweissmitteilungen*, v. 15, no. 28, 1957, p. 13-46.

Economic advantages of high strength structural steels. New trends in welding and new welding electrodes.

18610 Magnesium Castings Can Be Welded Without Distortion. H. Mansfield and L. Gesualdo. *Product Engineering*, v. 28, Sept. 1957, p. 94-95.

Salvage process is adapted to permit minor additions without preheating, porosity, and cracking in the weld. Mechanical properties of weldments.

18611* (Russian.) The Influence of the Shape of Skelp Edges on the Welding Seam Strength of Tubes. **Vliianie formy kromok shtripsov na prochnost' svarnogo shva trub.** E. M. Tsygankov. *Stal'*, v. 17, no. 8, Aug. 1957, p. 728-730.

18612 Brazing for High Temperature Use. G. S. Hoppin. *Steel*, v. 141, Aug. 26, 1957, p. 82 + 3 pages.

Critical assemblies for jet engines are brazed with Ni-base alloys in dry H atmospheres.

18613 Electrode Quality Depends on Coating. Harry F. Reid, Jr. *Steel*, v. 141, Sept. 30, 1957, p. 83-84.

The coating transfers essential minerals and purifiers to a weld deposit, providing great flexibility to match the job's requirements.

18614* (Russian.) Welding of Cobalt Austenitic Steel. **Svarka austenitnoi kobal'tovoi stali.** M. M. Timofeev. *Svarochnoe Proizvodstvo*, 1957, no. 8, Aug., p. 1-3.

Experiments with manual arc welding of forged EI 673 steel containing 20% Cr, 20% Ni, 20% Co and Mo, W, and Cb additions. Some attempt to develop a satisfactory electrode by addition of alloying elements in the coating.

18615* (Russian.) Shielding Gases for Arc Welding. **Zashchitnye gasy dlia dugovoi svarki.** A. V. Petrov. *Svarochnoe Proizvodstvo*, 1957, no. 8, Aug., p. 6-10.

Changes in composition of shielding gases used in arc welding affects arc behavior and metal properties.

18616* (Russian.) Effect of Current Direction on Location of Center Nugget in Spot Welding of Light Alloys. **O vliianii napravleniia toka na raspolozhenie iadra svarnoi tochki legkikh splavov.** D. S. Balkovets. *Svarochnoe Proizvodstvo*, 1957, no. 8, Aug., p. 14-15.

Displacement of nugget explained on the basis of electrothermic effect. Shows a possibility of utilizing the effect in welding members of different thickness.

18617 (Swedish.) Designs of Welds for Close-Tolerance Metalworking Machines. **Svetsade maskinkonstruktioner med små toleranser.** Per V. Norlin. *Svetsaren*, v. 22, no. 1, 1957, p. 11-22.

Welded joint shrinkage. Fatigue strength. Permissible stresses. Examples include a hydraulic wallboard press and a 400 ton ship-building press.

18618* (German.) Vacuum Welding Technique. **Schweissen in der Vakuumtechnik.** Werner Espe. *Vakuum-Technik*, v. 6, no. 5, Aug. 1957, p. 91-98.

A survey of methods. Construction of high vacuum and gas discharge pipes. Spot-weldability of metals, especially of sheet metals.

18619 A New Nodular Cast-Iron Welding Rod for Foundries and Fabricators. R. O. Day, J. S. Snyder, and H. V. Inskeep. *Welding Journal*, v. 36, Sept. 1957, p. 410s-414s.

18620 The Experimental Determination of Bonding Temperature. Gregory Blanc and R. D. Wasserman. *Welding Journal*, v. 36, Sept. 1957, p. 419s-422s.

Graphic method used to determine bonding temperature for three filler alloys.

18621 Inert-Gas Tungsten-Arc Spot Welding of an Automotive Transmission Subassembly. W. G. Mertens and O. J. Ryder. *Welding Journal*, v. 36, Sept. 1957, p. 871-876.

Multiple spot welding for high-speed production and uniform product quality.

18622 Boiler-Code Welding and Joint Design With the CO_2 Process. J. D. Carey, Jr. *Welding Journal*, v. 36, Sept. 1957, p. 877-880.

18623 Welding Problems in Pressure Vessels for Nuclear Reactors. R. E. Lorentz, Jr. *Welding Journal*, v. 36, Sept. 1957, p. 881-887.

Fabrication of nuclear-reactor components. Rigid quality control is essential.

18624 Consumable-Electrode Inert-Gas Welding With Small-Diameter Wires. K. E. Richter and J. F. M. Essig. *Welding Journal*, v. 36, Sept. 1957, p. 893-899.

Process is capable of producing excellent quality welds in thin-gage materials at high welding speeds.

18625* (Russian.) On the Nature of Intercrystalline Cracks Near the Weld Made by Fusion Welding. **O mekhanisme obrazovaniia okoloshovnykh mezhkristallicheskikh treshchin pri svarke plavleniem.** B. I. Medovar. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 7, July 1957, p. 1571-1574.

Study of the causes and means of prevention.

18626* (Slovak.) Investigation of Characteristic Properties of Brazing Alloys of Ms60 Type. **Vyšetrenie charakteristických vlastností tvrdých spájok typu Ms60.** Viliam Ruža. *Zváranie*, v. 6, no. 8, Aug. 1957, p. 235-242.

Requirements for brazing alloys. Physical and mechanical properties of alloys Ms60SiSn, Ms60Ag, and MsNi8. Tensile, shear, fatigue, and impact bending strength of brazed joints. Tensile tests at elevated temperatures. Evaluation of results obtained.

See also: **17979** (application of socket-head cap screws); **17981** (design of weldments); **18049** (corrosion of Ti welds); **18115** (heat treatment of welds); **18119** (furnace brazing atmosphere); **18124** (flame hardening of welds); **18175** (brittle fracture of welded plates); **18267** (ultrasonic testing); **18274** (ultrasonic inspection of welds); **18275** (ultrasonic inspection of welds).

MISCELLANEOUS

18627 American Gas Association, Proceedings, 1956. 797 p. 1956. American Gas Assn., New York. (TP700 Am35p Vis.)

Includes numerous papers and reports on recent developments in various phases of the gas industry.

18628 Buying Contract Research. An Inside Guide to "Outside" Research. Melvin Mandell. *Dun's Review and Modern Industry*, v. 70, Sept. 1957, p. 46 + 7 pages.

Describes how to get the most for your money from "outside" research.

18629 Three New Appraisals of Engineers. *Dun's Review and Modern Industry*, v. 70, Sept. 1957, p. 93-95.

A survey of Jack & Heintz, Inc. shows that engineers usually are clumsy in human relations, but are very willing to overcome their difficulties.

18630 Hearings Before the Select Committee on Improper Activities in the Labor or Management Field. Eighty-Fifth Congress, First Session. Pt. IX. 369 p. 1957. U. S. Government Printing Office, Washington, D. C. (HD6508 Un3.27i)

18631 Industry and Technical Progress. C. F. Carter and B. R. Williams. 244 p. 1957. Oxford University Press, London. (T177 C24i)

Factors governing the speed of application of science and technology in British industry. Problems of communicating research results to industry. Economic, personnel, and management problems.

18632 Modern Mathematics for the Engineer. Edwin F. Beckenbach, editor. 514 p. 1956. McGraw-Hill, New York. (QA401 B38m)

A broad survey of the application of advanced mathematics to today's rapidly expanding technology. Text emphasizes the importance of stochastical analysis, the theory of games, operations analysis, and linear, nonlinear, and dynamic programming in modern engineering.

18633 First Fire Research Correlation Conference, November 1956. *National Academy of Sciences, National Research Council*, Publication 475, 1957, 279 p. (TH9112 N21f)

Proceedings consist of 22 papers on fires, their prevention and especially their control. Included are forest, aircraft, industrial, mine, radiation, and incendiary fires.

18634 National Industrial Research Conference, Proceedings. 57 p. 1957. Armour Research Foundation, Chicago. (T176 N21.2p Vis.)

Twelve papers on the themes: sales growth through research, more research for the dollar, and extra dividend from research.

18635 How Engineer-Contractors Handle a Job. J. S. Parker, Jr. *Petroleum Refiner*, v. 36, Sept. 1957, p. 277-285.

Presents the steps to job completion.

18636 Proceedings of Symposia in Applied Mathematics. v. VI. Numerical Analysis. J. H. Curtiss, editor. 303 p. 1956. McGraw-Hill, New York. (QA1 Sy68p)

A collection of 19 papers.

18637 Science and the Nation. The B.B.C. Reith Lectures for 1956. Edward Appleton. 104 p. 1957. Edinburgh University Press, London. (Q171 Ap53s)

A series of radio lectures describing the pattern of British scientific research.

18638 A Method for Minimizing a Function of *n* Variables. William A. Nierenberg. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3816, June 1957, 8 p. (UF767 U3u Contin.)

Method for finding the minimum of a function of an arbitrary number of variables by a series of successive approximations using a paraboloidal fit. It is particularly suited for computer programming if a matrix inverting routine is available.

18639 Vector Spaces and Matrices. Robert M. Thrall and Leonard Tornheim. 318 p. 1957. John Wiley & Sons, New York. (QA261 T41v)

A thorough, systematic approach which stresses up-to-date methods of mathematical reasoning.

See also: **17690** (mathematical techniques for electronics).

Initially, Battelle has assigned a twenty-man team of experts to the Radiation Effects Information Center. Coordinator of the Center is Battelle's C. B. Voldrich, with Dr. Robert I. Leininger and Carl J. Lyons serving as assistants. Gilbert F. Arthur of Wright Air Development Center is the task engineer.

* CASTING Al-U ALLOYS

Aluminum-uranium alloys have certain advantages that make them particularly applicable for relatively low-temperature reactors. Their usefulness for extruded fuel elements, however, has been limited by the impossibility of consistently producing nonporous, homogeneous extrusion blank castings. The difficulties appear to be caused by the release of absorbed hydrogen during solidification, leading to porosity and internal shrink pipe and turbulence during pouring. Moreover, separation of the alloy is aggravated by low pouring temperature and gravity segregation.

In a paper presented before the American Nuclear Society, Ellis L. Foster, Jr. and R. F. Dickerson of Battelle reported on a casting procedure which is capable of producing nonporous, homogeneous extrusion blank ingots of the aluminum-16 weight per cent uranium alloy on a commercial scale.

Basically the technique calls for the molten alloy, thoroughly mixed and degassed, to be poured at a temperature between 730 and 760 C into a specially designed steel mold heated to about 500 C. An aluminum insert is placed in the bottom of the mold and tapered so that it will remain in contact with the alloy as the casting cools. Directional solidification is achieved by directing a flow of water around the mold, which is suspended in a tank after the alloy is poured. A cooling rate of about 70 C per minute has been established as sufficient to prevent segregation. This technique provides for an entrant temperature sufficient to give good surface conditions and progressive cooling at a rate sufficient to prevent segregation and porosity.

* SOME TRENDS IN METALLURGY

The changing field of metallurgy is one of constant broadening, with emphasis here and there, rather than complete shifts in activity, Battelle's Bruce Gonser pointed out in a recent talk before the Kansas City, Missouri, chapter of the American Society for Metals.

One of the pronounced trends has been the increased attention to metal purity. This has been promoted by the realization of the importance of nonmetallic impurities, including gases. Purity has been produced most dramatically by metallurgists, in cooperation with physicists, in the field of semiconductors where almost unbelievable controlled purity is demanded. Almost equally dramatic has been the growth in producing and investigating the unusual metals, many of which have assumed importance only after their true properties were revealed by extensive purification. A great field of basic investigation still lies ahead in making metals of exceptional purity and systematically finding the quantitative influence of single and multiple impurities on various properties of interest.

The demands for materials of construction for higher and higher temperatures have brought into prominence the need for more information on the mechanical properties of the high-melting metals and their alloys—tungsten, tantalum, rhenium, molybdenum, and columbium. Likewise, along with the contemplated use of these and other metals that are susceptible to attack by oxygen or nitrogen at high temperatures, such as zirconium, vanadium, and titanium, has come the demand for protection against these gases. Alloying so far has aided only moderately, if at all, and much attention continues to be given to cladding and to protective coatings by various means. This brings about the need for cooperation between metallurgists and ceramists.

With the need for increased strength of many metals at higher than normal temperatures of use, has come the trend toward adding inert constituents for "dispersion hardening". The incorporation into a metal base of a minor percentage of an oxide or carbide or other insoluble compound, or even another insoluble metal in powder form, may give a surprising increase in hot strength without interfering seriously with workability or other mechanical properties. This may apply to common metals such as lead, copper, and aluminum as well as to high-temperature metals.

One of the interesting examples of metals that have shown ductility when obtained in a highly purified form has been chromium. Much work has been done to demonstrate the effect of minor impurities and to show inherent ductility. However, because of its poor resistance to impact, the recent trend has been to use high purity chromium in alloys, with iron and nickel, as to the extent of 50 to 60 per cent chromium.

Dr. Gonser observed that, as the demand for various metals has increased, new sources of supply have been found. Now there are extremely few examples of metals where demand exceeds supply.

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